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EDITORIAL.

THE CONTEST for the governorship of Colorado is at an end, and that is the best that can be said of it. Either Alva Adams or James H. Peabody was elected, but political corruption prevented the Legislature from facing the logic of facts, with the result that a compromise was reached, the lieutenant-governor being chosen as State executive. Of Governor McDonald we can say that, whether at Leadville or Aspan, he has won esteem as a capable mine manager and operator. Colorado has come out of her troubles, not with dignity, but at least with a measure of good luck; for the present Governor is worthy of representing her manifold mining activities.

TELLURIDE OF GOLD is said to have been found in Rhodesia. Ten years ago this would have been sufficient for some pseudomorph of a professor to expatiate on the fact as evidence of persistence of ore in depth. We have changed all that. The mining world has learned that the tellurides are no evidence of anything of the kind, save a refractory metallurgical character; and even this has been overcome by the technical skill expended on the output of Cripple Creek and Kalgoorlie.

WE GIVE CONSIDERABLE space elsewhere in this issue to new regulations adopted by the Home Office in Great Britain for the use of electricity in coal mines. These regulations have been adopted by a committee of experts after careful study of the subject, and after consultation with a large number of mine-owners. They constitute a body of rules which, while they apply, of course, especially to British conditions, deserve thoughtful study wherever electric wire is used to transmit power in a coal mine. We think that they will be found worthy of careful reading.

THE RECENT FATALITY in Sonora, resulting in the killing of Mr. Mackenzie and his companions by some Yaqui Indians, has given the impression that northwestern Mexico is dangerous to industry; but we are informed that conditions have been exaggerated. The Yaqui country forms only a small part of Sonora; prospecting camps and mining villages in that State have never been molested, the only trouble

experienced being the occasional attacks upon parties traveling on the roads leading to Ortiz, Minas Prietas and Torres. There is no organized rising among the Yaquis; the Mexicans living in the Indian country have not been compelled to leave their farms, or ranches, and the Mexican government has not considered it necessary to patrol the roads from Torres or Ortiz. At the present time military protection is afforded to travelers. A few marauders are the cause of all the trouble. Mining development has not been hindered.

AN IMPORTANT California oil field, in the northern part of Santa Barbara county, has practically passed under the control of the Standard Oil Company, which has contracted with nearly all the principal producers to take their output for long periods at a fixed price. In the case of one company—the Western Union, which is the largest operator in the field—the contract is for 100 months, covering the entire output of the wells at 30 cents a barrel.

THE OLD CONTROVERSY with regard to damage done by sulphuric fumes from smelting plants to vegetation in the adjoining country has reached an acute stage in California. The United States Circuit Court has issued an injunction against the operation of the smelting plant of the Mountain Copper Company, at Keswick, in Shasta county. Proceedings in the case have extended over several years, the contention of the plaintiff being that the sulphurous fumes were ruining vegetation and destroying land values in the vicinity of the works. The United States was one of the parties in this suit, as it owns lands in the neighborhood of the smelter. The Mountain Copper Company, as we have heretofore noted, anticipated some such action, and some time ago began to build a new plant near Martinez, on the shores of San Francisco bay, where it proposed to smelt the sulphurous ores, saving the fumes and utilizing them in the manufacture of acid. Only one furnace has been running at Keswick for some time.

This does not end the trouble, however. No suit has been begun against the company's new plant, but proceedings have been started against the Selby Smelting & Lead Company, which also has a plant near Martinez, on the bay shore. This action has been begun by neighboring farmers and land-owners, who seek to enjoin the company on the ground that the fumes from its smelter are injuring vegetation. The Selby smelting works are the most extensive on the Pacific Coast, and have been exceedingly well managed. There is no doubt that the suit will be contested.

DETAILS DESCRIBING the big diamond recently found in South Africa will be found on another page. The splendid stone has been named the Cullinan, in honor of the chairman of the company controlling the Premier mine. Although a magnificent treasure, the Cullinan diamond is only part of a larger undiscovered stone, from which it has been broken off during its geologic wandering. Owing to its size, the discovery which astonished the world on January 26 has an indeterminate commercial value. As measured per carat, the stone has been estimated to have a value of $45,000,000 if from 3,032 carats it should be cut down to half its present size; but this is improbable. Nevertheless, even if rated at $5,000,000 it represents too much money and is too large except as contributory to royal splendor. The Excelsior diamond, of the Jagersfontein mine, weighed 971 carats when found, and after cutting it became reduced to 239 carats, but even this surviving portion remains unsold. In this perplexity it has been suggested that a public subscription be raised to purchase the Cullinan and present it to King Edward. It is obvious that this monstrous diamond illustrates that one can find "too much of a good thing." Thirty 100-carat stones would have been more merchantable.

THERE IS TALK of a geological survey for Colorado. It will seem anomalous that no such organization should exist. At present the only State office bearing directly on the mining industry is that of the Bureau of Mines, the chief of which is the Commissioner. This department was created ten years ago, and has done good service, despite the encroachment of politics. Colorado ought to have a geological survey, if the need of it is to be measured by the importance of the mineral production, and there is no doubt the universities and the School of Mines within the State are able to provide a scientific corps capable of doing good field-work. But we do not advocate the establishment of a survey with much enthusiasm, simply because we fear that its efficiency will be undermined from the start by political intrigue. It is politics which has crippled the usefulness of other State surveys, and unless the appointment of geologists can be made for a long period, and appropriations assured independent of a venal legislature, it is not likely that the mineral development of Colorado will be hastened or bettered by a geological survey.

The New York Mining Market.

We observe with interest that, among the mining shares recently quoted on the New York curb market, are Dolores and Stratton's Independence. The active list now includes about ten mines. On the Consolidated Exchange the transactions include dealings in a dozen mines, belonging chiefly to Cripple Creek and the Comstock; on the Stock Exchange list, there are only the Anaconda and the Homestake mines. It is a pitiable condition of affairs when the transactions incidental to a great business like mining are afforded no better facilities than those just mentioned. New York is a great financial center, but as a mining center it remains as yet only a provincial town compared to London. An active and reputable market for dealing in mining shares is much needed.

At the present time an enormous amount of ill-spent money goes into mining; we refer to the 'fiscal agents' and other *chevaliers d'industrie* who peddle stocks in mining claims to innocent dabblers on the margin of the business world; to people of small means, clerks, car-conductors, waiters and nursemaids, not omitting the clergymen, retired officers of both services, and other educated people who endeavor to eke out a precarious existence by an occasional 50 per cent so-called investment in an outcrop situated on the top of some lonely hillside out West, or in a placer claim lying idle under the blistering sun of a deserted cañon, a piece of worthless scenery which becomes metamorphosed into a potentiality of wealth through the alchemy of imagination brought to bear upon it by some downtown spoofer. If the money thus squandered were spent in sound enterprise, and if the public were but protected when once they become shareholders, mining would gain immensely, and with it the whole of the great mineral empire included within the borders of these United States.

But before this hope can be consummated, it is necessary that the laws regulating the operation of mining companies shall be enforced. Laws exist which, if enforced, would tend, like the Companies Acts in England, to compel that publicity which is one, at least, of the safeguards against wrong-doing. Whitaker Wrights and Hooleys may prance across the financial stage and ridicule the performances of mining; but, in the main, the English shareholder gets more protection than his fellow speculator on this side. Hence the capital which seeks mining in America largely takes the form of individual and syndicate operations with big sums of money, or of the distribution of low-priced shares through irresponsible agencies. The kind of man who supports the operations of the London financier has not enough money to buy a mine, and he is not fool enough to play the game of the trickster who peddles five- and ten-cent shares. It is in the Lake Superior region, under the safe and sane management of experienced men, that mining by large companies is seen at its best; but, even in that region, the shareholder is safeguarded, not by the law, but by the character of those who are in control. If the State laws compelled publicity and a compliance with regulations enforcing a proper responsibility, then the business of mining speculation—call it that, or 'investment,' as you will—would win the support of the best men in the community, instead, for instance, of requiring an apology from the dignified bankers and merchants who now take part in it *incognito*.

Mexican Duty on Dynamite.

This matter is attracting increased attention. From a communication in *The Mexican Herald*, obviously inspired, it is evident that the officials of the dynamite concession are becoming alarmed at the uneasiness caused among mining men by the effect of their ill-considered action. Obstinate protestation to the effect that the factory of the Mexican National Explosives Company can supply the demand; that the quality is equal to that of any imported; that the tax only amounts to 4 per cent of the total cost of mining; that mining men are unduly disturbed—all this merely serves to show clearly that the action does partake of the nature of an imposition. It is painfully evident that the officials will try to avoid the appearance of excessive extortion, at the same time making the burden as heavy as the mining industry will support. This is clearly shown by the evident partiality exercised in the application of the tariff to different districts, as instanced in the case of Sonora, which is favored with only one-seventh of the general duty "on account of the lack of transportation," a status which means the privileged importation of American powder for the West Coast. We have direct information of the apprehension justly entertained, by companies of the highest standing, over this thinly veiled extortion. Even a 4 per cent tax, the estimate of Mr. Auguste Genin, the manager of the Explosives Company, can be prohibitive for many mines. Our comment is only emphasized by the excuses of the favored Explosives Company. Mexico is not encouraging sound mining. The lavish disposal of special privileges, such as the beef-killing concession to certain gentlemen from California, or that of mining grants to promoters from New York, in all of which the particular goodwill of the highest officials is expressly stated, is of ill omen for the future of Mexico, and we trust that there will be protest sufficient to check the corruption of an enlightened government.

The Rossland Consolidation.

Those who are concerned with the development of British Columbia are keenly interested, at this time, in the proposed consolidation of the leading mining enterprises in the Rossland district. It has been known for some time that negotiations were pending for the amalgamation of Le Roi mine with the War Eagle and Centre Star properties. More recently, the names of the Snowshoe and the Kootenay mines have been included in the scheme, and, finally, there has been mooted a union of the smelters at Trail and Northport, respectively. The Northport smelter belongs to Le Roi Mining Company, while the Canadian Smelting Works at Trail is controlled by the great transcontinental railroad of the Dominion. In the first place, the idea of placing the three big mines at Rossland under one administration was prompted by economy, and the operation of a smelter common to all three was intended to diminish the proportion of expense swallowed up in the cost of treatment and railway freight. Le Roi has operated, in a rather intermittent and expensive manner, the smelter at Northport, which is on the Great Northern Railroad and just within the border of the United States. The War Eagle and Centre Star properties have sent their product to the Trail smelter, with the result that one-half the value of the ore went to pay the Canadian Pacific Railway, while the other half went to meet wages and supplies. The shareholders depleted their ore reserves without benefit to themselves, but for the good of the community; they were unwilling altruists. The ore of Rossland is a pyrrhotite containing a little copper in association with a minute quantity of the precious metals; the matrix is diorite, therefore the gangue is silicious. The average tenor is $7 to $8 per ton. It is believed that the output of the Snowshoe and Kootenay mines will help to secure a proper smelting mixture. Moreover, if the Trail smelter is included in the scheme, the enterprise will be assured of the cheap coke controlled by the Canadian Pacific Railway and will secure the services, as general manager, of Mr. W. H. Aldridge, now chief of the mining department of that railroad company. Finally, by way of supplement, there is the suggestion to make an arrangement with the Granby Consolidated Company, in the Boundary district, which can furnish a fluxing ore, chiefly magnetite and chalcopyrite in a lime matrix, also suitable for smelting with the Rossland sulphides. This ore is worth from $3 to $4 per ton, and it is, metallurgically, extremely docile.

Unfortunately, from a metallurgical standpoint the Snowshoe ore would be useless as a base for the Rossland pyrrhotite because it carries an excess of silica, being, in this respect, less docile than the ore of the Boundary district, in which it is situated. The Kootenay yields a material which is mainly pyrite and pyrrhotite, in diorite, so that, in a metallurgical way, it cannot help Le Roi or Centre Star. To bring the Granby ore to the smelters now in receipt of the Rossland output would mean a journey of 130 miles over a mountain divide; at present the cost of transport for this haul is $1.50, and it might be brought down to $1, but even this burden would prove prohibitive. Here we encounter the factor which dominates the situation; it is largely the rivalry between the Canadian Pacific Railway and the Great Northern Railroad. The latter controls the business of the Boundary district and also unites Rossland to Northport; the

elimination of the Trail smelter would mean the diversion of traffic to Mr. Hill's system, while the inclusion of the smelter now managed by Mr. Aldridge might lead to the closing down of the Northport works. Whether the mining companies involved would not suffer by antagonizing their domestic railroad, a railroad controlling supplies of fuel and backed by the government of the country, is a question they will decide for themselves. It is an old problem: smelting and mining interests eating each other up until finally financial dyspepsia prompts a dose of the pepsin of good sense.

The United States Steel Corporation Report.

The report of this company, a full abstract of which is given on another page, deals with figures so large that we seem rather to be considering the finances of a nation than those of an individual corporation. A company which has liabilities carried on its balance sheet of $1,591,014,068, with assets of an equal amount, which has property valuations amounting on its books to $1,373,967,046, and a current working capital of over $200,000,000, is a concern certainly far beyond any other ever known, in standing and importance. Moreover, the properties of this corporation produced last year 44.7% of the pig iron output of the United States, 69.1% of the bessemer steel, 50.4% of the open-hearth steel, and over 60% of the finished iron and steel products. Its employees constituted an army of 147,343 men, and they received during the year $120,763,896 in wages.

Last year, as we all know, was not a prosperous year for the Steel Corporation. The great falling off in demand and prices in the iron and steel trade, which manifested itself in the closing months of 1903, and which continued to be felt well into the first half of 1904, struck the corporation very hard. The depression was felt by the great combination probably to a greater extent than by most independent producers, who managed to retain a larger share of their trade, though at the expense of concessions in prices, which doubtless reduced the profits of their business largely. In spite of the decrease in business the gross sales of the Steel Corporation for the year were $444,405,430, a sum enormous enough in itself, but considerably less than the returns of the previous year. At one time it was feared that the total would fall below four hundred millions, but the improvement in business in the second half of the year made the better showing possible. How closely, even with the improvement referred to, the corporation was obliged to work is shown by the fact that out of the enormous sum earned in 1904, there remained a balance of only $5,047,852, after paying dividends on the preferred stock, although the special credits to improvement funds, which were made in the previous prosperous year, were last year omitted. There is every prospect at present, however, that the returns for the current year will make a much better showing.

Additions to the property of the corporation last year were not as great as had been expected. The only one of importance is found in the purchase of the Clairton steel property, which was fully discussed at the time it was made. For this property the company paid $1,000,000 in its own bonds, besides assuming bonds and mortgages amounting to $12,896,715. The question whether the property was worth this addition to liabilities of nearly $14,000,000 is one which has been much discussed, and which still remains unanswered.

Of this, as of former reports of the corporation, it is to be said that it deserves commendation for the full showing of the company's position and operations. It is true that the earnings and the production are given in mass, and that there are few details with regard to the separate properties; but it must be remembered that these could not be given without overloading the report with a mass of detail which would really defeat its object, and would prevent the average stockholder from obtaining a clear idea of the general position of affairs. It must also be said that the corporation's system of accounting must be one of extraordinary excellence. That so full a statement can be presented in a little over two months after the end of the year is really an achievement, when we consider the vast extent of the business and the large number of properties operated—mining, manufacturing, transportation and selling—scattered over a large part of the country.

Market Conditions.

March 22.

The metal markets show no appreciable change. Domestic buyers of copper continue conservative, but foreign buying is fair. Silver has been dull, with small fluctuations.

The iron and steel markets are active, with a tendency to advancing prices.

The coal markets in the West are still suffering from over-supply. In the East coal is steady and in good demand.

Metallics.

Culled from all sources. Our readers are invited to assist this department by sending simila material.

Concentrated sulphuric acid reacts slowly on metallic zinc; but the action is enormously stimulated by diluting it with water.

Concentrated sulphuric acid is an active and corrosive dehydrator and oxidizer; but it does not exhibit its acid qualities proper until it is diluted.

So close is the analogy between the pressure and flow of water and that of electricity, that a study of the so-called 'hydro-dynamics' is helpful in obtaining a clear view of electrical phenomena.

Mineral Production of Colorado.

The advance report of E. L. White, Commissioner of Mines of Colorado, gives the metal production of the State in 1904 as follows:

Metal.	Quantity.	Value.
Gold.....Oz.	1,171,892	$24,223,008
Silver.....Oz.	12,960,777	7,416,157
Lead.....Lb.	107,546,854	4,624,514
Copper.....Lb.	9,401,913	1,205,607
Zinc.....Lb.	64,976,235	3,313,788
Total value.....		$40,783,074

In this statement gold is valued at $20.67 per ounce, and the other metals at their average prices in New York, as given by this JOURNAL. The zinc is figured on actual production of spelter from Colorado ores.

Nine counties in the State produced over a million dollars each, in value, as follows: Teller (Cripple Creek), $14,483,905; Lake (Leadville), $9,575,210; San Juan, $2,853,090; Ouray, $2,467,525; San Miguel, $2,189,148; Pitkin, $2,046,409; Mineral (Creede), $1,973,983; Gilpin, $1,704,938; Clear Creek, $1,404,739. The smallest value reported from any county was $253, from Mesa.

The largest production of gold—nearly 60% of the total—was from Teller county; Ouray, San Miguel and Gilpin following in order. Lake county reported the largest output of lead, with Pitkin second and Mineral third. In copper, Lake also leads, with San Juan second. Lake county reported 90% of all the zinc, Mineral being the only other large producer. Lake county also reported the largest quantity of silver, Pitkin being second, and Mineral third in order.

DISCUSSION.

Readers are invited to use this department for the discussion of questions arising in technical practice or suggested by articles appearing in the columns of THE ENGINEERING AND MINING JOURNAL.

THE COST OF MINING.

The Editor:

Sir—The scope of such a discussion is necessarily wide, but in the following I shall confine myself to certain fundamentals, rather than to a comparison of examples. An intelligent study of mining costs must be preceded by an analysis of the various items going to make up the total, in order to obtain a segregation that shall be logical and useful. Such items as Mr. Ingalls gives in his brief tabulation are certainly useful, but they do not yield the whole, or even the larger part, of the value that the figures in themselves contain. This, I understand, Mr. Ingalls recognizes, and I have no doubt that he will fully indorse the statement that a classification in this form may conceal details of the first importance to the engineer.

In the first place, it is pertinent to inquire, What are the uses to which accounting lends itself? There is the obvious use of supplying a business need; of giving to the stockholders, present and prospective, a reliable idea of what the property can do in the way of profits; and, in general, how it is managed, though it must be admitted that comparisons of cost in this way may be misleading. In fact, they are chiefly valuable in raising inquiries that only a more logical segregation can answer. These commercial accounts will naturally fall under obvious and simple heads, presenting what would be, from the engineer's point of view, mere summaries of the more extended subdivisions which are technically useful; and it is the logical basis for these technical accounts which particularly concerns this discussion.

This basis may be simply a cutting of expenditure into small items, as is the case in Mr. Ingalls' table. Frequently this is all that is done, and the valuable information afforded is considered the end of the business. But there is more to be gained than these figures directly give; and, with this fact in view, it is worth considering what it is for which the engineer really has use. As manager, he wishes to compare his accounts, month by month and year by year, both with themselves and also with those of other mines, as a check upon operation and for suggestion of improvement; so far as this goes, the items, as given herewith, answer fairly. But he wishes also to know how costs will be altered by change in tonnage. This is a matter of importance, for the mine manager as well as for the examining engineer; it is imperfectly given by such a system, except for those divisions which are direct functions of tonnage. Some accounts are not functions of tonnage at all, such as superintendence, offices and taxes; others are not proportional functions, such as pumping, hoisting; there is a long list of such accounts.

Then both the manager and the examining engineer need a division; this should recognize accounts: (A) that are independent of, and (B) those that are dependent on, tonnage; that is, (A) where the totals for a period do not alter with variation in tonnage, and (B) where they do so alter. Further, under (A) there are some (A1) accounts that are practically constant, such as 'superintendence and management,' and others (A2) that, while independent of tonnage, are variable, such as those that alter with change of season, traveling expense, etc. In close estimates it will help to have these known separately. (B) also has two natural subdivisions: (B1) where totals are virtually direct functions of tonnage, and (B2) where totals are indirect functions of tonnage; that is, they alter with tonnage, but not proportionately. Examples of (B1) are 'stoping' and 'tramming'; (B2) includes development, which varies according to conditions of mine and orebodies; also certain repairs.

There is another large class of accounts, namely, those additions to plant, equipment and repairs that will make themselves felt over extended periods; in other words, 'capital expenditures.' These should be redeemed by charges against operating expenses over varying periods. Whatever may be the business policy of charging these off, there can be small question that the accurate logical treatment for the engineer is to consider them as a part of his operating expense, month by month. No estimate of cost which roughly assumes that such expenditures will equalize themselves will be fair; if they are not put into 'working cost' there is always the danger that they will be overlooked entirely in making estimates. A division of expenditure on these lines can be carried out to any extent of itemization, and will give a system of technical accounts that will furnish all the data desired.

In studying the problem of a proper segregation, it will be seen that none of the advantages of the more common systems of plain subdivision will be lost; the basis is applicable to the smallest as well as to the largest mines; the degree of subdivision can be extended, as easily as in any other system, to any degree of minuteness demanded.

In the foregoing I have aimed to outline a familiar principle; it is so well established that a large part of the recent discussion in this JOURNAL on 'Mine Equipment and Ore Reserves' hinges upon it. However, though the principle is not new in practice, so far as I know, before the discussion referred to, it had not been brought out in print.

R. GILMAN BROWN.

San Francisco, March 1, 1905.

GOLD-QUARTZ VEINS IN VICTORIA.

To the Reader:

Sir—The views of so capable a geologist as Mr. Lindgren on vein phenomena, which have been described by many investigators, will be read with keen interest. I refer to his article in this JOURNAL of March 9. A thorough training in the deciphering of ore occurrences in our Western mining regions enables him to place his finger on the salient features of lode structure in the Australian districts which he visited last year. My own recollections, many of which have been put in print elsewhere, are pleasantly revived. Nothing will erase the memory of the moment when, going underground at the 2,200-ft. level of the New Chum & Victoria mine, I first saw a saddle reef and realized its true anticlinal structure. The current idea was that "the east leg went with the formation," and that "the west leg cut across it," the confusion being due entirely to the strong cleavage which on one side had obliterated the bedding, and on the other was in deceptive harmony with it. But that was fifteen years ago. Subsequently I wrote a paper, describing the geology of Bendigo, and submitted certain theoretical considerations. These were the combined result of observation and the teaching derived from authoritative writers—the books on ore deposits by Van Cotta and J. Arthur Phillips, together with such monographs as Emmons' 'Leadville' and Becker's 'Comstock.' It would be remarkable if any man would not like to modify his views after an interval of fifteen years, especially in regard to those principles of ore deposition which have been developed to a satisfactory philosophy only lately. Apart from this, a hard-working mining engineer of average attainments is apt to lay himself open to friendly criticism from the specialist in geology. This I have done; and the criticism, now and formerly, has, I doubt not, conduced to the development of sound views as much, if not more than, any of my original writings.

The Ballarat 'indicator' remains one of the most curious of the structures associated with the occurrence of gold. There is no question that it is later than the flat veins of quartz which it dislocates, and that they are enriched at the place of crossing. The view that the 'indicator' is a narrow fissure is, of course, the alternative to the idea that it is a thin layer of slate; but good evidence—something more than reasonable conjecture—is needed to substantiate such an explanation. There are a great many such thin beds of slate, from black streaks to bands several inches thick, and their similarity can be observed through graduated diminution of thickness. The whole system of steeply dipping quartz seams conforms to the bedding of the slate and sandstone; and there is no difficulty in distinguishing between them and those other occurrences of

quartz which occupy cross-fractures. The latter are poor, except where enriched by intersection with the former; and, judging from the water now encountered, it is probable that the veins which follow the bedding planes coincide with the main passageways of former mineralizing solutions. The 'flat makes' are usually white quartz, devoid of pyrite and other sulphides.

When Mr. Lindgren discusses the theory of ore deposition as applied to Bendigo, he touches me on a tender spot. I wrote before Posepny had differentiated the water circulation, before Van Hise had stirred the pool of controversy, and before Emmons and Weed had crystallized the theory of secondary enrichment. Fifteen years ago, Sandberger and his narrow hypothesis of lateral secretion were in the ascendant; and when I emphasized the view that ore deposition was a successive process of concentration, due to a widespread underground circulation transferring the metals distributed through a great series of altered sediments, it was to combat the notion of their derivation from the wall-rock and the precipitation of them in one sudden congealing of super-saturated solutions. In saying that "the origin of the deposits of gold-bearing quartz belongs to no particular period," I meant that the process of segregation, culminating in a concentration of ore rich enough to warrant exploitation, was the cumulative result of agencies which had been at work during successive periods. I think the context bears this out. The deposition of the quartz in the Silurian rocks may have coincided with the pre-Devonian intrusion of granite; but the formation of the richly gold-bearing veinstuff is associated with the much later intrusion of the Tertiary limburgite, for the dikes of this basic irruptive exhibit the effects of mineralization and the precipitation of gold. The formation of the bodies of gold ore now being mined at Bendigo did not begin and end within the limit of time assigned between the Lower Silurian and the Devonian periods, although even that interval, humanly speaking, may have been vast, indeed. Von Richthofen's dictum, that a region once mineralized is apt to be mineralized again, is confirmed by the observation that underground waters tend to find old passages, or those which are created alongside by subsequent dislocation of the rocks, in a region which is within the sphere of volcanic unrest.

As to the reduction of gold solutions by carbonaceous matter, I am not inclined to lay as much stress upon it as formerly. It has since become obvious to me that the precipitants for gold are many, the solvents few. Gold solutions, as we know them in the laboratory (and that is the only place where they are definitely available for experiment), are easily broken up. The hot alkaline solutions, which bring the metal from the deeper horizon to that within the reach of mining, are quick enough to lay down their precious burden. Carbon, in the form of the remnants of organic life buried in the Silurian sediment, was, according to good evidence, one of the reducing agents; but the arsenopyrite, common to the gold-bearing quartz of Bendigo, was probably another; and, in the light of recent testimony, sulphur dioxide, the product of decomposing sulphides, was, in all likelihood, a third precipitant. Mr. Lindgren says it is not apparent why this precipitation should not have taken place long before the solutions reached the fissures. Well, in the first place, they were not fissures in the sense of being cross-fractures traversing a series of strata; for the Bendigo gold occurs along lines of bedding, and especially in the folds of slate beds overlying a hard sandstone. Where the gold-quartz occurs in 'spurs' and other cross-veins, it is usual to find that the rich portions are intersected by 'leaders,' 'legs' and other members of the series of deposits conforming with the bedding. In the finer silt, which became slate, there were more organic remains than in the sand, which became sandstone. It is not difficult to understand why deposition was postponed until the mineralizing waters reached the place where the ore is now found; on the approach to surface the lessening of pressure, and the lowering of temperature, afforded conditions which became increasingly favorable to precipitation.

The theory that the gold of the saddle reefs came from ocean sediments (laid down in Silurian time, to become the slate and sandstone of today) is open to attack on several sides; no one appreciates it better than I. But who shall say what the origin—the first beginning—of the gold was? Obviously, we can rest the mental eye on one stage only. The granitic magma is a possible source; so is the barysphere; so is an indefinite something deeper still. I suggested that the sediment of the Silurian seas contained gold, as the ocean water contains it today; it was assumed that this disseminated gold became subject to leaching at a later time when the pressure of overlying strata raised the temperature, and eventually, during earth movements, afforded ways of underground circulation. Many granites are the extreme phases of metamorphosed sedimentary rocks; the student of ore deposits can choose the original sediments, or a vague barysphere, as the source of the granite. In any event, the region of solution was deep, and the region of deposition was shallow; and the vehicle of transference from the one to the other was underground water, the origin of which also is open to a similar cyclical argument.

Mr. Lindgren is warranted in offering "with confidence" the hypothesis of deposition due to "eruptive after-effects," more particularly as against the rudimentary explanations which I offered fifteen years ago. If he had offered it at that time he would have anticipated much observation and hard thinking. I mean, that the view he adopts is the composite theory which has grown out of the work of a large number of geologists and mining engineers during recent years. To the building of this theory Mr. Lindgren has given the service of an architect, and I that of an artisan. Many have contributed—some the design, others the stone; some the mortar, others the mere manual labor. But no general theory is the work of one man—not that Mr. Lindgren claims such authorship; he is much too modest a scientist to do anything of the sort—but when the "eruptive after-effects" theory is put up against the "marine theory," my sense of humor is awakened, simply because the latter was a suggestion vitalizing the observations collected at one particular locality, while the now generally accepted view of ore deposits as the *sequelæ* of volcanic unrest is the philosophic product of ten years of scientific discussion, the work of a large company of earnest investigators.

In my papers upon the Enterprise mine, the lodes of Cripple Creek, and more especially that on the Cripple Creek volcano, written during the past ten years, I have advocated the formation of ores as due to the thermal activity which follows in the wake of volcanic disturbance. In the meanwhile the occurrence of gold in sea water—despite the absurdity of some of the efforts to extract it on a commercial scale—remains a fact; the inclusion of large quantities of such water in the sediments laid down on the ocean floor (fully 25% of the weight of such sediments, when laid down, is water) is not open to dispute; the expulsion of the water by the pressure of overlying material and the slow upbuilding of rock formations under conditions of increasing temperature is not likely to be questioned; so that it is not a far-fetched explanation to suppose the concentration of an infinitely thin solution and the segregation of the gold to an extent sufficient to afford play to the agencies which fetch and carry the precious freight of ore deposits. Such gold in the sediment becomes thinly disseminated through the resulting rock; and whether it is dissolved and conveyed to the place of ore deposition through the agencies which are part of the "eruptive after-effects" is another story—a story in the truth of which I believe.

T. A. Rickard.

New York, March 12, 1905.

CRUDE OIL FOR FIRE ASSAYING.

The Editor:

Sir—In your issue of February 2, I read with great interest an article on the use of crude oil for fire assaying, by F. C. Bowman. Mr. Bowman's results and his experiments with gasoline especially interest me, as they give a basis for compari-

son with my own experience. In my work I am using a Calkins Advance No. 10 combination furnace, which has a capacity of twelve 12-gram crucibles and eighteen 1½-in. cupels at one firing. The burner used is of the same make as the furnace.

Gasoline consumption in this furnace amounts to 0.85 gal. per hour. This is 0.20 gal. greater than the consumption in Mr. Bowman's experiments. The increase in gasoline consumption is more than balanced by the larger capacity of the furnace, and by the fact that in making a run of 24 assays it is possible to cupel the first set of buttons while fusing the second in a Calkins furnace.

The time required in heating the Calkins furnace and completing 24 fusions and cupellations is one hour and forty minutes, starting with everything cold. The cost of gasoline here is 31.5 cents per gal., therefore the cost per fusion is 1.85 cents. At 40c. per gal. for gasoline, the price that Mr. Bowman pays, my cost would still be less than one-half what it cost him.

ARTHUR E. PETERSON.

702 Main Ave., Spokane, Wash.

MEXICAN DUTY ON DYNAMITE.

The Editor:

Sir—The ventilation of the whole question of the attitude of the Mexican Government toward mining is sorely in need of attention. Various taxes are imposed, from the time the ore is stoped up to the exportation of bullion, which limps off minus a trifle of 7 per cent. This last action is particularly interesting in view of a certain Article 28, of the Mexican Constitution:

"There shall be no monopolies nor privileged places of any kind, nor prohibitions with titles of protection to industry. Those only shall be excepted which relate to the coining of money, to the post-offices, and the privileges which, for a limited time, the law may concede to inventors or perfectors of some improvement."

Commenting on this, a recent issue of *The Daily Record*, of Mexico City, says: "If this concession stands, what will it not lead to? If one industry is tied up like the explosive industry is, what can stop the same movement in other directions that will paralyze all other industries in the same way?

"Some of the best posted men in the country are absolutely emphatic that the concession which has been granted to the Mexican Dynamite & Explosives Company is directly contrary to law, and infringes Article 28 of the Mexican Constitution, which is published at the head of this article.

"Concessions granted by the government give a monopoly of the dynamite business to the Mexican company. A careful reading of the amended concession which was published in the *Diario Oficial* of February 1 will show that a practical monopoly has been given."

Communications from experienced engineers on the ground furnish much interesting side light. In the *Diario Oficial* of Mexico City for March 1, 1905, the text is given of several changes that have been made in the contract with the company that holds the exclusive right to manufacture dynamite in this country. These changes are interesting as showing the force that public opinion has exercised in the matter, as a tariff is laid down establishing the price that may be charged in a variety of places throughout the Republic, and thus doing away with the expressed fear that the whole of the proposed duty would be borne by the consumers. Further, March 1 of this year is set as the date for the protective duty to go into force—which fixing of a date might possibly be an indication of pressure brought to bear on the belated factory to comply with the condition of having enough stock to supply the demand. The first and essential clause of the revised contract reads as follows:

"By the first of March, 1905, or when the company can show that it is in a position to supply the dynamite demand of the country, it shall be decreed, by initiative of the Executive, or by Congressional authorization, that an internal tax be applied to the consumption of all dynamite or explosives imported or manufactured in the Republic, said tax to amount to $210 per 1,000 kg., gross, or 21 cents per kilogram." (Of course, Mexican money.)

The contract dates to March 1, 1917, and from the time when selling is begun the company has to pay—for the first nine years—one-seventh of the duty imposed on other importers or manufacturers; after that time they will pay two-sevenths of the tax.

On the West Coast, which will include Sonora, they are authorized to import explosives from the States and only pay the one-seventh of the duty that they would be taxed if they had manufactured the explosive themselves. This concession is on account of the lack of transportation facilities from this side, and practically makes them privileged agents for American powder on the West Coast.

The tariff stipulates a price of $15.98 per box of 50 lb. in Chihuahua per car-load lots of 400 cases, less 5% discount. For less than 200 cases add $1.50 per case. In quantities over 200 cases it results in powder costing in Chihuahua at the rate of $16.68 per box. The present quotation on California powder is $15.25, showing an increase of $1.43 per box. In these figures 40% powder is taken throughout.

Curiously enough, the price established for Miñaca exceeds the Chihuahua price by 48c. more than the freight per box between the two places. No Sonora points are mentioned in the tariff, but if the Mexican company will give their Sonora customers the benefit of their preferential payment of duty, and content themselves with the regular agency profit on what California powder they supply, the Sonora price of powder will be increased by 3c., Mexican, per kilo., or 68c. per case.

In *The Mexican Herald* of March 12, 1905, Mr. Auguste Genin, manager of the National Explosives Company, and Mr. W. S. Morse, southwestern manager of the American Smelting & Refining Company, are interviewed on the effect of the new tariff. Mr. Genin would naturally attempt to allay any false alarm; but his quoted remarks fall far short of quieting the facts which we miners must meet. Mr. Morse advises that the present status is not excessively worse than our previous condition, and he closes with this: "The miners are 'hollering' before they are hit. Better for them and for their industry to wait for a few months so that the effects of the new law may be observed and provision made for contingencies that may arise." All this sheds further light, as we observe the associations of the defenders of the extortionate duty.

A communication from Torreon, also published in *The Mexican Herald*, discusses the relations of the price of dynamite from the Mexican factory, $17.20 per case, as compared with $17.35, the price of the product of the American trust. It is reported that the latter will meet the rates established by the Mexican concession, as rates on car-load lots are not quoted without communication with the home office. Let us hope that, even on this high basis, there will be some latitude for competition; but this cannot step below the minimum imposed by the concession price.

Another unpleasant feature of the duty is the elastic variation which is stretched according to the locality; the duty of $210 Mexican does not apply to points on the Pacific Coast. Evidently the intent is to reserve some semblance of reason in loading those districts whither transportation is difficult.

I realize that this letter contains much diverse material, but it all bears on the general subject of your recent outspoken editorial (this JOURNAL, March 9, 1905). You can do great service to the profession by inviting full opportunity for advertising the facts in this move of Mexico, which bears all the characteristics of a clumsy but stalwart and presuming corruption. Only the richer mines and larger corporations can endure this added strain. The attention of the highest Mexican officials should be called to the disinterested criticism you have voiced. I hope the organized protests of engineers, recently assembled in Mexico City, may be given to us through your columns.

AMIGO.

Durango, Mexico, March 14, 1905.

Ferro-phosphorus, containing 21% of the latter, according to a recent European patent, can be made by the electric fusion of 1,110 parts calcium phosphate, 630 of silica, 525 of pyrite, and 510 metallic iron.

Mining Stocks.

(Full quotations on pages 583 and 584.)

New York. March 22.

For a short time prices sagged, the bear operators being at cross play with the bulls, who are working for a big revival in speculation. Public buying has been smaller this week, but at the close an improvement is shown. Amalgamated Copper changed hands at $78.75@$80, Anaconda at $29.375@$30; Greene Consolidated at $28.375@$28.625, and British Columbia at $7.50@$7. Another W. C. Greene property is being floated, the Greene Gold-Silver Company, capitalized at $15,000,000 in $10 shares, of which 100,000 are offered at par. The company controls a large concession of mineral-bearing land in Mexico, including a group of old mines in Jesus Maria, Chihuahua, and is privileged to buy, sell and work other mines, custom ores, etc.

The gold and silver shares were quietly dealt in. Alice, of Montana, is lower at $1; Portland, of Cripple Creek, advanced to $1.95; Horn Silver, of Utah, went to $1.85 on declaration of a 5c. dividend; and Ophir, of Nevada, was exchanged at $6.75.

Some interest was manifested in the industrial list. American Smelting & Refining common shares moved at $102@$103.50, and the preferred at $122@$122.875. Federal Mining & Smelting common stock changed hands at $110@$115, and the preferred at $95@$96.50. United States Steel common was quoted at $34.50@$35.875, and the preferred at $94.50@$95.75 per share.

Boston. March 21.

The mining share market has tapered off somewhat during the week, and prices have also yielded quite materially. The possible exception is Osceola, although this stock got a bump which broke it $3, to $97; subsequently it rallied to $101, and closed the same as a week ago, at $100. The buying and suppport in this stock has been good, on the prospects of an increase in the dividend at the next declaration. Copper Range, which sold ex-dividend of $1 last week, is off $3.75, to $77. In his efforts to put this stock up Lawson met a large amount of selling from the office of President Paine, who is a broker, and Lawson's market operations have subsided somewhat as a result, with some little feeling between the president and the operator.

Outside of the reports of the Mohawk and Isle Royale mining companies, issued during the week, there has been but little of moment. The former earned a surplus of $130,477 for 1904. The Isle Royale made a net profit of $17,104. Mohawk stock fell $2.75 during the week, closing at $53, and Isle Royale fell $2.37½, to $25, recovering a part. Fluctuations in the latter were wide at times. Centennial fell $1.87½, to $17.62½. The strike fever seems to be reaching the Lake mines, as the Quincy had one, and settled it, and now the Franklin has one on hand. Quincy stock went off $12, to $104, recovering $2, and Franklin is off $1.25, to $11. Good things are said of Tamarack, and the stock holds firm around $134@$135.

Utah is steadier, at from $41.75 to $40.75, and United States yielded $1.50, to $25.50, on lack of support by the pool. Wolverine is also off $7, to $112, with nothing said. Allouez closed fractionally lower, at $23, as did Atlantic, at $17; Michigan, at $14.50; Old Dominion, at $27, and Parrot, at $28.50. Trinity went off $1.37½, to $10.62½, recovering to $11. A $1 dividend has been declared by the Baltic Mining Co. This stock is practically all owned by the Copper Range Consolidated. The Keweenaw Copper Co. will soon be exploited in this city, having 400,000 shares, par $25. The price will be $10. It is a Michigan company, and but 150,000 shares will be issued at present. The formation of the company is similar to that of the Copper Range Consolidated.

Colorado Springs. March 17.

Trading in Cripple Creek shares on the local mining exchange was rather inactive during the fore part of the past week, but strengthened considerably before the close and remained so, although prices did not advance perceptibly in many instances.

The report of the El Paso shows the rate at which this mine has been forging ahead during the past year. The total production for the year ending January 31, 1905, was $1,355,935, being about three times the production for the previous year.

There were no features during the week of any importance. Acacia is selling at 10½ and 11. Anaconda at 18½, an advance of over 3c. during the week. Elkton declined during the week to 52½, but recovered and closed at 60. El Paso reached the high point of $1.99 ex-dividend, and sold to-day for $1.99⅞. Findley has declined from 82 to 78. Isabella remains stationary at 30 to 30½. Portland has advanced from $1.03 to $.97. United Gold Mines is selling for 26. Work is selling for 15⅜. Gold Coin is quoted 40 ask, no bid. Vindicator, 78@86. Golden Cycle, 50@60. C. K. & N. sold during the week for 17.

San Francisco. March 16.

Business in the Comstocks has been rather quiet, and prices have shown no great change, being somewhat weaker, if anything. The buyers seem to be holding back. Ophir sold at $6.75; Consolidated California & Virginia, $1.75; Mexican, $1.85; Hale & Norcross, 71c.; Sierra Nevada, 40c.; Potosi, 12c. per share.

On the San Francisco & Tonopah exchange business was pretty good, and prices did not fluctuate very widely. Montana Tonopah sold at $2.80; Tonopah Midway, $1.15; Tonopah North Star, 55c.; Black Butte, 43c.; Original Bullfrog, 40c.; Paymaster, 6c. per share.

On the California exchange trading in oil stocks was rather slow. There was one sale of Hanford at $195. Monte Cristo brought 80c.; Forty, 48c.; Home, 41c. per share.

The monthly reports of the mining companies, as filed in their offices this week, show cash on hand, March 1, as below, with expenses paid, unless otherwise stated: Alpha Consolidated, $2,311; Alta, $251; Andes, $6,170; Best & Belcher, $1,145; Belcher, $118, with mining expenses for February only partly paid; Bullion, $2,844; Caledonia, $5,342, with February expenses unpaid; Consolidated California & Virginia, $2,813; Chollar, $4,153; Consolidated New York, $2,496; Confidence, $3,100, with February expenses unpaid; Challenge Consolidated, $2,172; Consolidated Imperial, $1,774; Crown Point, $2,621; Exchequer, $718; Gould & Curry, $6,140, and bills receivable at $390; Julia Consolidated, $1,453, with concentrate to hear from; Mexican, $2,532; Ophir, $24,945; Overman, $7,264; Potosi, $5,939; Savage, $291; Sierra Nevada, $4,884; Silver Hill, $12,298; Segregated Belcher, $2,434; Standard Consolidated, $24,627, with February clean-up and February expenses to be accounted for; Syndicate, $791; Union Consolidated, $4,590; Utah Consolidated, $2,623. Several companies on the list are now collecting assessments.

Monterey. March 14.

Exchange on New York continues at 202. Mining stocks were rather inactive, but of sales reported, the prices were strong, and Victoria brought $46; Roma, $16; Esmeralda, Matehuala, $195, and La Paz, $296; La Blanca, Pachuca, $55; Amistad y Concordia, $73, and Soledad, $1,275.

Coal Trade Review.

NEW YORK, March 22.

ANTHRACITE.

In order to make up for the shortage of last month, the hard coal trade is moving briskly. This week's snowstorm up the State proves that coal-burning weather is not quite passed for this season. Mines are working full time, but some little difficulty in transportation and in delivery from terminal points still remains.

Steam sizes have recovered from their flurry of last week, and normal prices are resumed.

Announcement of the coming season's circular prices may be expected within a few days. For the remainder of this month, however, prices will remain at their old level, domestic sizes selling at $4.75 for broken, and $5 for egg; steam sizes range $3 for pea, $2.25@$2.50 for buckwheat, $1.45@$1.50 for rice, and $1.30@$1.35 for barley; prices quoted are those asked at harbor shipping points.

BITUMINOUS.

The Atlantic seaboard soft coal trade shows considerable activity, but most of the urgent orders are out of the way, and producers are working upon contracts in hand. Contracts for the coming season are being closed quietly, and the tonnage already placed must be large. The smaller sizes of anthracite have been cutting prices and are competing to a certain extent with soft coal. Some business has been diverted by this step, but at this writing the offering of small coal has not demoralized the bituminous market.

The labor convention is being held at Altoona, and a conciliatory spirit is being shown by both sides. The old question has arisen as to the almost ruinous competition from the non-union regions, owing to the high wages called for by men in the union regions. What seems to be preventing them from taking this into consideration is the fact that they are fighting for position for next year. The difficulty on the part of the producers who are dominated by the labor unions comes in trying to name a price at cost or below, in order to meet a quotation which may show a good profit to an operator in a non-union region.

Trade in the far East shows an active demand, which appears to be the result of an accumulation of orders during the transportation difficulties that existed last month. Trade along the Sound is quiet, except at those ports that have only recently been relieved of their ice-bound conditions. Trade in New York harbor is fairly active, but all urgent orders seem to be disposed of. Current quotation is about $2.75, f. o. b. shipping points. All-rail trade continues active, and prices are strong. Car supply has improved to about three-quarters of the requisitions, and transportation is in excellent condition. This has allowed shippers to cover all their more pressing requirements.

Coastwise vessels are in fair supply,

but freights are not strong, owing to the rapidity with which the vessels are coming out of winter quarters. Philadelphia quotes on large boats as follows: To Boston, Portland and Salem, 75c.; to Sound ports, 60c.; to Newburyport, 90c.; to Portsmouth and Bath, 75@80c.; to Saco, Gardner and Bangor, $1. Rates from Norfolk and Newport News are about the same, but on all charters from these ports the loading and discharging clause is demanded, because of the three weeks' delay in unloading.

Birmingham. March 20.

The Alabama coal production shows a little improvement over conditions last week. The splendid weather which has prevailed during the past fortnight has been in favor of a large coal output. There is a strong demand for all the coal that can be mined.

A merger has been perfected among several independent coal companies in this district, including the Pratt Coal Co., Townley Mining Co., the Ivy Coal & Iron Co., together with 25,000 acres of recently purchased coal lands in Walker county and in the extreme western part of Jefferson county, under the name of the Consolidated Pratt Coal Co. The capital stock is said to be $500,000. T. T. Hillman is president of the company, with Erskine Ramsay, G. B. McCormack and H. E. McCormack on the directory. Ex-Governor Jackson, of Maryland, is interested in the company, recently purchasing 25,000 acres of coal lands in this State, which was added to the company above named.

The Red Star Coal Co., with mines in Walker county, has increased the capital stock from $25,000 to $75,000. It is proposed to develop property owned. The Premium Coal Co. has been incorporated by R. W. Jackson, F. M. Jackson, G. M. Bowers and L. G. Bowers, capital stock $20,000. This company will open mines at once. E. C. Chairsell, James A. Ware and John H. Miller have incorporated the American Coal & Mining Co., capital stock $10,000. The company has a small mine in Jefferson county.

State Mine Inspector J. M. Gray announces the coke production of Alabama to have been during the year 1904 2,284,095 tons, with 8,969 ovens, a large number of which were not in operation during the year. The production in 1903 amounted to 2,658,158 tons. The production in 1904 was reduced on account of the strike of the union coal mine workers and the concerted plan to curtail the production of pig iron.

Chicago. March 20.

Dulness prevails generally in the coal market for both anthracite and bituminous. The mild weather of the last week, together with the expectation of a reduction of 50c. on coal bought next month, accounts for the slackness in the anthracite trade; bituminous sales are unsatisfactory, partly on account of the weather and partly because of the chronic trouble with the market—overproduction. There is also the usual desire of dealers to escape having on hand any large amount of coal April 1, when assessments for taxing purposes are made.

No official announcements have been made as yet about anthracite prices for the coming year, but it is expected that there will be no change from the base car price of $6.50, operative from September 1 to April 1, with a graduated scale of discounts ranging from 50c. in April to 10c. in August, the decrease in the discount being 10c. per month. Retailers in Chicago get $6.75 when the base price obtains, and make discounts from this to correspond with the wholesale price.

The few orders that are being received by dealers in anthracite are for small lots, but orders are being taken for delivery in April at full discount prices, and these sales are reported fairly good. The prospects are, indeed, that April business will be considerably better than the business of the same month last year.

Western steam lump brings $1.70@$2; run-of-mine, $1.50@$1.70, and screenings, $1@$1.40. Eastern bituminous, while stronger than western, is weak generally. Smokeless is in large supply, and run-of-mine probably has not brought, on most sales, the circular prices of $3.05@$3.15. Youghiogheny shares the depression, and brings about $2.90. Hocking brings 10c.@15c. less than the $3 mark, and is in large supply.

Cleveland. March 21.

During the past week the shippers of coal up the lakes have been able to come to terms with the vessel men as to the contract rates during the coming season. The basis is identical with that which was in effect during the past season, namely, 35c. to the head of the lakes and 45c. to Lake Michigan points, principally Milwaukee. The vessel owners had been contending for a higher rate this year, but the fact that the ore rates advanced so slightly had the effect of cutting down rather than increasing the coal rates, which last year were higher in proportion than the ore rates. The movement of coal up the lakes will begin in a short time, since a good many of the boats are already loading, the railroads moving material in here rather freely.

The coal situation has not changed much. The demand for coal for movement up the lakes has had a tendency to lessen the congestion in Lake Erie ports, with the result that the market is a little stronger. Quotations are now $1 at mine for run-of-mine steam coal for both the Ohio and the Pennsylvania product. There is a little easier feeling as to slack, due to the prospective opening of the season of navigation and the heavy shipment of ¾-in. coal. Slack is now selling at 60@65c. at mine for both Ohio and Pennsylvania.

Pittsburg. March 21.

Coal.—The rivers are at a flood stage to-day, which will leave a good boating stage before the end of the week. Some damage was done to a number of loaded coal boats and barges by the ice, but there will be several million bushels ready for shipment to lower ports. The railroad mines in the Pittsburg district are being operated satisfactorily, and there is no complaint as to shortage of railroad cars. Preparations are being made by the Pittsburg Coal Co. for a big lake trade, and it expects to fill all contracts in the northwestern market, which greatly exceed the business booked by that company last season. It was reported during the week that an eastern syndicate had begun negotiations for the purchase of the Pittsburg Coal Co.'s interests in the Monongahela River Coal & Coke Co., but the report was officially denied. Prices remain about the same, and are on a basis of $1@$1.10 a ton for run-of-mine coal.

Connellsville Coke.—Shipments were unusually heavy last week, and the big surplus stocks in the region are rapidly going down. Prices are firm, at $2@$2.25 for furnace and $2.75@$3 for foundry coke for present delivery. It is reported that furnace coke for second-half delivery will be about 25c. a ton higher. The production for the week was 261,822 tons, a gain of 594 tons over the previous week. The shipments aggregated 12,463 cars, distributed as follows: To Pittsburg and river points, 4,761 cars; to points west of Pittsburg, 6,150 cars; to points east of Everson, 1,552 cars.

Foreign Coal Trade. March 22.

Exports of fuel from Great Britain for the two months ending February 28 are reported as below, in long tons:

	1904.	1905.	Changes.
Coal	6,469,943	7,251,538	I. 781,595
Coke	108,018	101,788	D. 6,230
Briquettes	207,007	179,832	D. 27,175
Totals	6,784,968	7,533,158	I. 748,190

In addition to these exports, there were 2,589,559 tons of coal sent abroad for the use of steamers engaged in foreign trade in 1904, and 2,755,576 tons in 1905; an increase of 166,017 tons. The exports to the United States, included above, were as follows:

	1904.	1905.	Changes.
Atlantic ports	16,277	10,684	D. 5,593
Pacific ports	11,484	6,457	D. 5,027
Totals	27,761	17,141	D. 10,620

Shipments to Pacific Coast ports have been very light so far this year.

Returns from the custom houses show that the bunker coal supplied to steamships at United States ports during 1904 was as follows, in net tons:

	Coastwise.	Foreign.	Total.
Atlantic ports	1,834,270	3,597,354	5,431,624
Pacific ports	79,076	478,954	558,030
Gulf ports	411,065	177,739	588,804
Great Lakes	1,321,619	821,536	2,143,155
Totals	3,646,030	5,075,583	8,721,613

The total shows an increase of 546,446 tons over the year 1903. Of the total coal bunkered in 1904, coastwise vessels took 41.8%, and only the remaining 58.2% can be counted as exported. Adding the coal exported in 1904, we find that only 13,649,101 tons of coal mined in the United States were consumed beyond its limits.

Iron Trade Review.

NEW YORK, March 22.

Activity is reported in almost all branches of the iron trade. The demand for pig iron continues steady, and contracts are being made which extend well over the second half of the current year. It is understood that the outside furnaces in the Pittsburg district and the Mahoning and Shenango valleys are entirely sold up for some time ahead. In steel billets, premiums continue to be paid by parties in need of material. An important transaction in billets is noted in our Pittsburg letter, which follows.

In finished material, structural steel is meeting with a better demand, while in almost all other branches of the trade business continues very good. In steel rails, orders for standard sections are still somewhat behind, but a much better demand is developing for electric railroad material and for light rails. It is reported that some large orders for rails for export have been recently taken.

British Iron and Steel Trade.—Exports of iron and steel, and manufactures thereof, from Great Britain for the two months ending Feb. 28 are valued by the Board of Trade returns as below:

	1904.	1905.
Iron and steel	£4,383,664	£4,462,831
Machinery	2,946,241	3,068,578
New ships	442,093	584,209
Totals	£7,771,998	£8,115,6

Exports of mining machinery were valued at £152,697 in 1904, and £105,566 in 1905, a decrease of £47,131, which was chiefly in the shipments to South Africa. The chief items of the iron and steel exports were as follows, in long tons:

	1904.	1905.	Changes.
Pig iron	106,260	100,352	D. 5,908
Wrought iron	30,139	25,682	D. 4,457
Rails	81,245	88,281	I. 7,036
Plates	21,597	24,618	I. 3,021
Sheets	62,637	65,283	I. 2,646
Tin-plates	52,330	58,884	I. 6,554

A number of these items show increases, the principal ones being rails and tin-plates.

Imports of iron and steel for the two months were valued at £1,189,806 in 1904, and £1,230,900 in 1905, an increase of £41,094. Some leading items of these imports were as follows, in long tons:

	1904.	1905.	Changes.
Pig iron	17,438	20,357	I. 2,919
Wrought iron	23,914	12,356	D. 11,558
Steel blooms, billets, etc.	67,089	89,817	I. 22,728
Structural steel	37,040	25,082	D. 11,958

Imports of iron ore were 1,029,889 tons for the two months; of this, 886,777 tons were from Spain.

Birmingham. March 20.

Alabama furnace companies continue to book orders for pig iron to be delivered in the future. Considerable iron has been sold for delivery during the third quarter of the year. The aggregate sales made by some of the companies already this month are very encouraging, and the excellent tonnage disposed of during February, though a short month, promises to be duplicated this month. The Sloss-Sheffield Steel & Iron Co. sold up to March 17 over 25,000 tons of iron for March, with a number of inquiries still on hand. Sales agents of this company were informed during the past week that quotations had strengthened and $13.75 was the lowest price for No. 2 foundry. One of the larger iron companies in this district is behind in deliveries. One furnace is out of blast at Gadsden still, with two at Bessemer not making iron.

Special analysis iron is bringing a fancy price, a special order for No. 2 soft iron brought $15 per ton during the past week. Several small lots of No. 2 foundry iron have recently been shipped from this district to Mexico, the product bringing $14 per ton f. o. b. furnaces. A carload of No. 2 soft was shipped with all haste during the past week to Orizaba, Mex., for use in a foundry belonging to a Mexican railroad, and further similar rush orders are looked for from that section of the country.

The following quotations are given: No. 1 foundry, $14@$14.50; No. 2 foundry, 13.75@$14; No. 3 foundry, $13.25@$13.50; No. 4 foundry, $12.50@$13; gray forge, $12@$12.50; No. 1 soft, $14@$14.50; No. 2 soft, $13.75@$14.

Chicago. March 20.

The iron market is apparently growing firmer. Sales of the last week have been good and are increasing. Inquiries are for larger lots than heretofore, though the great bulk of the trade is still in small quantities. Foundrymen seem to have come to the conclusion that it is useless to hold out longer for lower prices, and are buying freely. Northern is the favorite in the local market now, the difference in price between Northern and Southern being of little importance in determining sales. Buying of Southern is also checked by the reluctance of dealers to sell for the last quarter of the year on ordinary terms. Northern is selling up to the end of the year in some cases, though most of the buying now, of both kinds, is for the third quarter. Most consumers have contracts for second-quarter deliveries.

Quotations continue unchanged, Northern No. 2 bringing $17.50, and Southern No. 2 being quoted at $13.50, Birmingham, or $17.15, Chicago.

The coke market is firm, Connellsville 72-hour being quoted at $5.65, with standard coke $5@$5.50. Coke is moving well, the surplus on tracks having been well disposed of.

Cleveland. March 21.

Iron Ore.—The shippers of ore down the lakes have about closed their season contracts, and some of them are now making wild charters for the opening of the season of navigation, which will begin in a short time if no hitch occurs. All evidences are that the ice conditions will make for an early opening of the channels between the lakes. A conference will be held this week, at which time the labor matter ought to be straightened up. The wild charters reported have been at the same rates as those announced for the season contracts, namely, 75c. from Duluth to Ohio ports, 70c. from Marquette, and 60c. from Escanaba. There is a little buying still on the basis of recent sales—$3.75 for bessemer old range, $3.50 for bessemer Mesabi, $3.25 for non-bessemer old range, and $3 for non-bessemer Mesabi.

New York. March 22.

Trade generally continues good, although in this market the orders recently have been largely for immediate consumption.

Pig Iron.—Pig iron prices are well sustained by the current demand. There has been some buying in moderate-sized lots for New England foundries. It is said that in one or two cases belated buyers have had to pay premiums for early deliveries.

Quotations continue at about the same level. For Northern iron we quote as follows for large lots: No. 1 X foundry, $17.75@$18; No. 2 X, $17.50@$17.75; No. 2 plain, $16.75@$17; gray forge, $16@$16.25. Some Virginia foundry No. 2 has been sold at $17.65@$17.90, while Virginia basic brings $17.15@$17.65. Southern iron is firmly held, and we quote for large lots on dock as follows: No. 1 foundry, $17.75@$18; No. 2, $17.25@$17.50; No. 3, $16.75@$17; No. 4, $16.25@$16.50; No. 1 soft, $17.75@$18; No. 2 soft, $17.25@$17.50; gray forge, $16.25@$16.50.

On the Produce Exchange the new rule for dealing in warrants went into effect March 20. Under this there are three classes of warrants, regular, foundry and bessemer and basic. The latest quotation shows for March and April delivery, for regular warrants, $16.45 bid and $16.75 asked; foundry, $16.60 bid and $17.10 asked; bessemer and basic, $16.50 bid and $17 asked. Business is still very quiet.

Steel Rails.—The regular quotation continues $28 per ton at mill for standard sections. Very little business is done in this market. Light rails continue in fair demand, prices varying from $23 for 35-lb. sections up to $28 for 12-lb. rails.

Old Material.—Scrap of all kinds is in good demand, and prices are firm. Old steel rails are still called for. Railroad wrought is quoted $20@$21; best yard wrought, $17@$18; heavy steel melting scrap, $16@$17; machinery cast, $14@$15. These prices are on cars, Jersey City or other terminal delivery.

Philadelphia. March 21.

Pig Iron.—Pig iron transactions during the past week have been restricted in some directions and extended in others. The chief feature of interest has been the sales of foundry and basic. Where late deliveries are wanted, there is no increase in price, but where special accommodations are insisted upon, the rates of premium paid are quite an item. There are offers now for 15,000 or 20,000 tons of basic iron, but the buyers are hesitating and doubtful whether the producing interests can maintain their rather arrogant position. The smaller buyers of foundry do not hesitate to pay the asking prices, and some of them are endeavoring to obtain relief from Virginia and other sources, but the oversold condition of furnaces in those States forbids. The tone of the market is decidedly strong. Quotations may be given approximately as follows: No. 1 X foundry, $18.25; No. 2 X foundry, $17.75; No. 2 plain, $17.25@$17.50; standard forge, $16.50; basic, $17@$17.25.

Billets.—The highest price paid for small lots of billets in this market is $30. Very little business has been done under $29. Quotations for large lots are given at $28, but there seems to be some hitch between makers and buyers, which does not appear on the surface as yet.

Plates.—The manufacturers are quite busy figuring over inquiries for supplies of plate for summer delivery, and it is thought that some large contracts will soon be placed. Mills are oversold, and, as usual, premium prices are being paid. Quotation for tanks in car lots, 1.73½; flange, 1.83½; fire-box, 2.23½ cents.

Pittsburg. March 21.

The features of the iron and steel trade for the week were the reported closing of a big deal for steel billets, and an advance in the price of sheets. Interest centers on a transaction said to have been made by the Pittsburg Steel Co., the large independent wire company. There have been several reports regarding the deal made, but none has been officially confirmed. While great secrecy has been observed, it was learned to-day from a reliable source that the company has just closed contracts for bessemer and open-hearth billets covering its requirements for 11 months beginning on July 1. The total tonnage will exceed 100,000 tons. Of this, the Republic Iron & Steel Co. will supply 6,000 tons monthly, and the Carnegie Steel Co. will furnish the open-hearth billets from its Donora and Clairton plants. Some of the steel may be furnished by La Belle Iron Works, of Steubenville. No price is named in any of the reports concerning the transaction. The first intimation that the Pittsburg Steel Co. was in the market came when the announcement was made, late last week, that it had opened negotiations with the Bessemer Pig Iron Association for 100,000 tons of iron, for delivery during a period of 11 months. It was then believed the company contemplated making a similar deal to the one made with the Republic Iron & Steel Co. last July, when it bought 110,000 tons of bessemer pig iron, to be used in conversion. By this arrangement it was figured at the time the Pittsburg Steel Co. got its billets at a rate of $19.25 delivered, or $3.75 a ton less than the pool price, which then was $23. The transaction caused considerable trouble, as the Steel Corporation made a heavy cut in wire products, and the price of billets was subsequently reduced. It is announced to-day, but not officially, that this deal has been abandoned, and a favor-

able arrangement made for getting the billets from the companies named.

Several sales of bessemer and basic pig iron are recorded to-day aggregating 40,000 tons. These sales, it is asserted, clear up all the available bessemer iron in the Pittsburg and Valley districts to June 1, and this has stimulated prices. It was said the United States Steel Corporation had not bought any of the iron, but is expected to come into the market for a good tonnage for April delivery. Despite the claims that foundry No. 2 was being shaded, several sales were closed last week at $16, Valley furnace. The association has fixed the minimum price for bessemer iron at $15.50, Valley furnace, and sales have been reported at $15.65. All the iron produced is going into actual consumption, and the large steel interest may be inconvenienced during the coming month, unless it can obtain an additional supply of outside iron.

No surprise was occasioned on Thursday, when the American Sheet & Tin Plate Co. announced an advance in black sheets, effective on that day. It was as follows: One-pass cold-rolled sheets, $2 a ton; Wood's refined iron, $2; blue annealed sheets, $1 a ton; painted corrugated roofing, 10c. a square. The advances correspond with the advances of $2 a ton for galvanized, $1 a ton on blue annealed, and 10c. a square on galvanized corrugated roofing made on February 9, and restore former differentials and making prices as follows on car-load and larger lots, f. o. b. Pittsburg, No. 28 gauge: One-pass, cold-rolled black sheets, 2.40c.; galvanized sheets, 3.45c.; Wood's refined iron, 2.70c.; corrugated roofing, per square, $1.75 for painted and $2.95 for galvanized. It is rumored today that another advance may be expected at any time on galvanized sheets. The leading interest is pretty well sold up through May, and has a number of contracts for more extended delivery. An advance in tin-plate was expected at the time sheets were advanced, and one will be ordered likely before the end of the week. The trade has been looking for an increase of about 10c. a box, but it was strongly hinted during the week that the advance will be a stiff one, and it is not improbable that tin-plate will be increased from $3.55 to $3.75 a box. The Whitaker-Glessner Co., of Wheeling, will endeavor to start its sheet and tin-plate plant at Wheeling to-morrow on a non-union basis, and, if successful, will put the sheet plant at Martin's Ferry in operation. Both plants have been idle for several weeks owing to a dispute with the Amalgamated Association on the limit of output. This strict Amalgamated rule, the company claims, is being violated at other union mills that are getting heavy production, and it wants the same advantages enjoyed by its competitors. There has been but little new buying of finished steel products during the week, but specifications on old contracts are heavy, and are taxing the capacity of the mills. Many mills along the Allegheny and Monongahela rivers were closed yesterday afternoon by the flood, and although the water has receded, most of the plants will not be in shape for resumption before Thursday or Friday.

Pig Iron.—Sales of pig iron during the week aggregated about 50,000 tons, and there are a number of inquiries. Prices are firm, being quoted as follows: Bessemer, $15.50@$15.65, Valley furnace; foundry No. 2, $16.85@$17, Pittsburg; gray forge, $16@$16.15, Pittsburg.

Steel.—Prices of billets and sheet-bars were stimulated by the advance in sheets, and stiff premiums over the pool prices of $21 for billets and $23 for sheet-bars, are asked. Merchant steel bars are firm, at 1.50c., and plates at 1.60c.

Sheets.—Not much new business has been booked, jobbers and consumers being more interested in getting deliveries. Black sheets, No. 28 gauge, have been advanced $2 a ton, to 2.40c., and galvanized sheets are firm at 3.45c.

Ferro-Manganese.—There is no change in the market, 80% domestic still being quoted at $45 per ton.

By Telegraph.

Pittsburg, March 22.—The details of the billet purchase by the Pittsburg Steel Co. show that the deliveries are to be 6,000 tons bessemer billets monthly from the Republic Iron & Steel Co., and 10,000 tons open-hearth billets monthly from the Carnegie Steel Works, the contract to run for 12 months, beginning with July next. This makes the total billets covered by the agreement 192,000 tons. The price is, approximately, $23 per ton delivered, with a strict guarantee against decline in prices.

Cartagena, Spain. March 4.

Iron and Manganiferous Ores.—Messrs. Barrington & Holt report that business is good and new contracts coming in. The tendency of prices is upward. Freight rates continue favorable to shippers, 5s. 6d. @5s. 9d. being quoted to Maryport and 3s. 6d. to Rotterdam. Shipments for the week were one cargo, 3,000 tons Colorado ore, to Great Britain, and one cargo, 2,570 tons magnetic ore, to Rotterdam.

Prices continue steady, as follows: Ordinary 50% ore, 6s. 6d.@6s. 9d.; special low phosphorus, 7s. 2d.@7s. 9d.; specular ore, 58%, 9s. 5d. Magnetic ore is nominal. For manganiferous ores prices vary from 10s. 2d. for 35% iron and 12% manganese, up to 14s. 9d. for 20% iron and 20% manganese.

Pyrite.—Iron pyrite, 40% iron and 43% sulphur, is quoted at 10s. per ton.

Chemicals and Minerals.

New York, March 22.

Preparations are being made for the spring trade, and, judging from the inquiries received, orders will be plentiful at firmer prices. Raw materials, excepting nitrate of soda, are easier, but only momentarily as sellers are disposing of odd lots to make way for new supplies.

The foreign trade of Great Britain in the two months ending February 28 is shown below:

	Exports.	Imports.
Bleaching powder, lb.	14,002,352	3,931,088
Borax, lb.	.....	5,114,816
Cement, tons.	55,162	34,343
Brimstone, tons.	.....	2,936
Chemical manures, tons.	69,530	.....
Copper sulphate, tons.	14,047	.....
Muriate of Ammonia, lb.	1,604,512	89,264
Nitrate of soda, tons.	.....	21,962
Phosphates, tons.	.....	62,849
Pyrite, tons.	.....	129,956
Salt, tons.	75,311	.....
Saltpeter, lb.	.....	2,999,024
Soda ash, lb.	32,163,376	
Soda, bicarb., lb.	9,233,504	
Soda, caustic, lb.	27,343,344	8,060,864
Soha crystals, lb.	3,388,112	
Soda, sulphate, lb.	6,490,176	
Sulphuric acid, lb.	1,953,056	549,696

Exports were chiefly to British territory and Mediterranean countries; imports largely from Spain, Germany, United States, and Chile.

Copper Sulphate.—Quiet. Second hands still quote $5.05@$5.10 per 100 lb., and makers $5.20@$5.25.

Acids.—Contract deliveries are seasonably good. Prices are firm.

Nitric acid, 36°, 100 lb.	$5.00
38°, 100 lb.	5.25
40°, 100 lb.	5.50
42°, 100 lb.	5.75
Oxalic acid, com'l, 100 lb.	$5.00@ 5.25
Sulphuric acid, 50°, bulk, ton	13.50@14.50
60°, 100 lb. in carboys	1.05
60°, bulk, ton	18.00@20.00
66°, 100 lb. in carboys	1.20
66°, bulk, ton	21.00@23.00

Sulphur and Pyrite.—In brimstone the situation is unchanged, and importers quote best unmixed seconds at $21@$21.25 per ton, and thirds 50@75c. less. Domestic sulphur for delivery at New York is firm at $21.45 for seconds, and $21.75 for prime. For Philadelphia and Baltimore prices are 25c. higher; to Portland, Me., 15c. Spanish pyrite, unwashed lump ore, carrying from 44 to 52% sulphur, is quoted at 10@11c. per unit, and fines at 9@9.5c., f. o. b. Atlantic ports. Domestic lump ore, 42 to 44% suplhur, is worth 9.5 @10c. per unit, and fines 8.5@9c., f. o. b. shipping points.

Sicilian Brimstone Market.—Messrs. Emil Fog & Sons, of Messina, write under date of February 28 that in the Italian parliament the Sicilian deputies interpellated the minister as to what steps he meant to take to protect the Sicilian sulphur industry against American competition. The minister deferred answering, his agents not having been able to obtain positive information regarding the production of the Louisiana mines. Statistics of Sicilian exports for January to the United States were 8,069 tons, against 3,222 tons in December. The Anglo-Sicilian Co. slightly increased quotations, which shippers cannot help to pay, as arrivals from dissidents have almost ceased, owing to the prohibition of fusing the ore while the cereal crops are on the field. At Catania the usual great demand for refined and ground sulphur has set in. All the mills and refineries are at full work. Treaties for the renewal of the contract with the Anglo-Sicilian Co. are actively pursued, but the approval of only about 40% was obtained. The majority of the proprietors would prefer to form a trust among themselves to avoid paying 8s.@9s. profits to the Anglo-Sicilian Co. If this saving could be obtained it would be very important, as we read in No. 13 of the German *Papier-Zeitung* that the saving in the Herreshoff pyrite burners as compared with brimstone is only 5 kroner a ton.

We quote per ton as follows: Best unmixed seconds, in bulk, 80s. 6d.; ground, in bags, 90s. 6d.; best thirds, in bulk, 77s. 6d.; current thirds, 72s. 6d.; refined block, 89s. 6d.@92s.; refined roll, 95s. 3d. @99s. 3d., and sticks, 103s. 6d.@106s.; sublimed flowers, pure, 107s.; current, 100s.; commercial, 94s. 3d.

Nitrate of Soda.—Prices for spot and nearby delivery are firmer as a result of delayed arrivals and the increased consumption. Spot is held at $2.45 per 100 lb.; April, $2.35; May, $2.32½; June, $2.30; July-December, $2.20@$2.25. For 95% prices are 2.5@5c. per 100 lb. lower than for refined quality. Ocean freights are stronger at 25s. Official statistics for the 10 months from April 1, 1904, to February 1, 1905, have just been received, and are given below in quintals of 101.4 pounds:

	1903–4.	1904–5.
Production	27,928,635	30,899,211
Exports	27,282,013	28,568,979
Consumption in World	21,733,220	22,529,110
Visible supply, Feb. 1	22,066,606	23,970,649

Notable changes in the past 10 months were an increase of 2,970,576 qtl. in production, and 1,904,043 qtl. in the visible supply. Consumption showed an increase

of only 795,890 quintals. The European consumption this year was 16,813,920 qtl., as against 15,964,300 qtl. in 1903-4; and that of the United States 4,835,754 qtl., as against 5,255,273 qtl. last year.

The statistical position of nitrate of soda in Europe in February and the two months of this and last year, is shown below, in long tons:

		—Jan.–Feb.—	
	Feb.	1905.	1904.
Exp. to Europe	111,627	218,341	197,059
Imports	146,430	220,700	265,180
Deliveries	171,200	239,050	258,790
Load. for Europe, Mar.1	.....	53,118	572,720
Vis.supply, Mar. 1	.....	639,370	.....

There was a decrease of 19,740 tons in this year's deliveries, and it is also worthy of remark that the visible supply on March 1, 1905, has been increased by 66,650 tons.

Sulphate of Ammonia.—Though there are no changes to report in prices, the situation of the market is easier. Spot gas liquor is quoted at $3.20 per 100 lb., and futures at $3.20@$3.25.

Phosphates.—Buying is limited, primarily because sellers with small stocks are unwilling to yield to the demands of consumers, who seem determined to lower prices to their advantage. Not only is the domestic market quiet in consequence, but export trade has slackened. By this statement, however, we do not wish to intimate that shipments abroad are decreasing; contrary, the orders taken some time ago will keep exporters busy for months to come. Fortunately, ocean freight rates are easier, and it is noteworthy that charters booked include many at 'private terms.' In producing centers there is increased activity in Tennessee, especially in Hickman county. At Toddy's Bend the Duck River Phosphate Company's property is being worked energetically to supply the Charleston (S. C.) Mining & Manufacturing Co. in accordance with its 10-year lease. In the Swan Creek section there is also much work being done by the National Acid Co., of New Orleans, by Swift & Co., of Chicago, and preparations are under way by the Jarecki Chemical Co., of Ohio, for a new plant on the Swan Creek spur of the Centerville branch of the N. C. & St. L. railway. In Florida similar activity prevails, and in South Carolina shipments show improvement.

Shipments of phosphates from Charleston, S. C., in February, were 7,914 tons, making 12,530 tons for the first two months this year, to Baltimore, Philadelphia, and Weymouth, Mass. The shipments of acid phosphate amounted to 6,400 tons in February, making 10,553 tons for the two months, to Pensacola, Norfolk, and Mobile.

Phosphates.	F. o. b.	C. i. f. Gt. Britain or Europe.
*Fla., hard rock	$7.25@7.50	$10.67@11.85
land pebble	3.75@4.00	7.70@ 8.40
†Tenn., 78@80%	4.35@4.40	10.27@10.67
78%	3.75@4 00	.....
75%	3.40@3.50	.....
68@72%	3.00@3.25	.....
‡So. Car. land rock	3.50@3 75	.....
river rock	3.25@3.50	6.33@ 6.61
Algerian, 63@70%	.....	7.04@ 7.71
58@63%	.....	6.15@ 6.60
Tunis (Gafsa)	.....	6.00@ 6.60
Christmas Isle	.....	13.28@14.11
Ocean Isle	.....	13.60@14.45
Somme, Fr	.....	11.39
Basic slag, 42@50%	.....	10.21@10.44
38@45%	.....	9.48@ 9.72
30@35%	.....	7.78@ 7.90

*F. o. b. Florida or Georgia ports. † F. o. b. Mt. Pleasant. ‡ On vessel Ashley River, S. C.

Liverpool. March 8.

Messrs. Joseph P. Brunner & Co. report that there is not much animation in new export business. Exports for February,

Soda ash is without change and firm. For tierces nearest range about as follows: Leblanc ash, 48%, £5@£5 10s.; 58%, £5 10s. @£6 per ton, net cash. Ammonia ash, 48%, £4 5s.@£4 10s.; 58%, £4 10s.@£4 15s. per ton, net cash. Bags, 5s. per ton under price for tierces. Soda crystals are quiet but steady at generally £3 7s. 6d. per ton, less 5s. for barrels, or 7s. less for bags, with special terms for a few favored markets. Caustic soda is meeting with rather more inquiry, and prices are steadily maintained, as follows: 60%, £8 15s.; 70%, £9 15s.; 74%, £10 5s.; 76%, £10 10s. per ton, net cash. Special quotations for the Continent and a few other export markets. Bleaching powder is in limited request at about £4 15s.@£5 per ton, net cash, for hardwood, as to market.

Sulphate of ammonia is dull and easier at about £13 3s. 9d.@£13 6s. 3d. per ton, less 2½% for good gray, 24@25% in double bags, f. o. b. here.

Nitrate of soda is in light request and £11@£11 5s. per ton, less 2½%, is about nearest spot range for double bags f. o. b. here, as to quality.

Metal Market.

New York. March 22.

Gold and Silver Exports and Imports.

At all United States Ports in February and Year.

Metal.	February.		Year.	
	1904.	1905.	1904.	1905.
G'ld Exp	$732,614	$14,794,312	$1,324,181	$31,621 480
Imp	5,034.372	2,190,980	13.259,880	4,086,671
Exc	I. $4,301,758	E$12,603,332	I.$11,935,699	E$27,535,809
Silv Exp	3,940,577	4,036,075	8,927,471	8,400,820
Imp	2,106,675	2,063,293	4,716,047	3,985,495
Exc	E. $1,833,902	E. $1,972,782	E. $4,211,424	E. $4,415,335

These exports and imports cover the totals at all United States ports. The figures are furnished by the Bureau of Statistics of the Department of Commerce and Labor.

Gold and Silver Exports and Imports, N.Y.

For the week ending March 18 and for years from January 1.

Period.	Gold.		Silver.	
	Exports.	Imports.	Exports.	Imports.
Week	$680,875	$1,388,291	$567,686	$192,963
1905	30,138,071	2,220,118	8,041,840	591,840
1904	1,911,660	1,105,039	11.290,890	171.775
1903	1,252,551	2,080,830	4,325,595	278,730

The gold exported this week went to the West Indies; the imports were chiefly from France. Exports of silver were principally to London; imports mostly from Central America.

There is no change to be noted in general business, which continues good. No further gold exports are reported.

The statement of the New York banks—including the 53 banks represented in the Clearing House—for the week ending March 18 gives the following totals, comparison being made with the corresponding week of 1904:

	1904.	1905.
Loans and discounts	$998,918,800	$1,127,678,400
Deposits	1,037,013,700	1,174,438,100
Circulation	36,913,800	42.803,500
Specie	217,239,600	215.060,000
Legal tenders	69,324.400	83,703,700
Total reserve	$286,564,000	$298,763,700
Legal requirements	259,253,425	293,609,525
Balance surplus	$27,310,575	$5,154 175

Changes for the week this year were decreases of $5,241,900 in loans and discounts, $13,227,700 in deposits, $61,000 in circulation, $6,129,700 in specie, $1,301,200 in legal tenders and $4,123,975 in surplus reserve.

The following table shows the specie holdings of the leading banks of the world. The amounts are reduced to dollars:

	Gold.	Silver
New York	$215,060,000	.....
England	198,832,845	$215,060,000
France	555,474,035	220,154,035
Germany	210,535,000	70,175,000
Spain	74,840,000	103,015,000
Netherlands	30,053,000	30,966,000
Belgium	16,090,000	8,045,000
Italy	111,530,000	16,919,500
Russia	505,250,000	31,700,000
Austria	240,540,000	64,175,000

The returns of the Associated Banks of New York are of date March 18 and the others March 16, as reported by the *Commercial and Financial Chronicle* cable. The New York banks do not report silver separately, but specie carried is chiefly gold. The Bank of England reports gold only.

The silver market shows a little more firmness than the close of last week foreshadowed. Buyers are more inclined to purchase, though no great strength is indicated in the present situation.

The United States Assay Office in New York reports receipts at 109,000 oz. of silver during the week.

Shipments of silver from London to the East for the year up to March 9 are reported by Messrs. Pixley & Abell's circular as follows:

	1904.	1905.	Changes.
India	£2,921,539	£1,644,887	D. £1,276,652
China	71,000	1,370	D. 69,630
Straits	58,103	2,800	D. 55,303
Totals	£3,050,642	£1,649,057	D. £1.401.585

Receipts for the week this year were £139,000 in bar silver from New York, £9,000 from the West Indies, £2,000 from Chile, and £6,000 from Australia; total, £156,000. Shipments were £238,500 in bar silver to Bombay.

Indian exchange has been firmer, owing to a greater call from India for money. Exports are not increasing, but business in India is very good, and it is said that the banks' cash reserves are getting rather low. The Council bills offered in London were taken at an average of 16.06d. per rupee. Buying of silver for Indian account, however, has been very slow.

The movement of gold in Great Britain for the two months ending February 28 was as follows:

	1904.	1905.
Imports	£5,604,019	£7,480,119
Exports	6,372,751	4,586,862
Balance	£768,732	£2,893,257

The movement of silver for the two months is reported as follows:

	1904.	1905.
Imports	£2,553,055	£2,118,384
Exports	2,993,844	2,267,028
Balance, exports	£440,789	£148,644

The United States is credited this year with £1,531,436, or 72.3% of all the silver imported.

The movement of gold in France for the month of January is reported as follows:

	1904.	1905.
Imports	Fr.12,325,000	Fr.48,652,000
Exports	6,796,000	8,193,000
Excess, imports	Fr. 5,529,000	Fr. 40,459,000

The movement of silver for the two months is reported as below:

	1904.	1905.
Imports	Fr.6,377,000	Fr.6,271,000
Exports	12,746,000	11,609,000
Excess, Exports	Fr. 6,369,000	Fr. 5,338,000

Imports of copper and nickel coins, rated at their face value, were 5,000 fr. in 1904, and 18,000 fr. in 1905; exports were 6,000 fr. in 1904, and 15,000 fr. this year.

Prices of Foreign Coins.

	Bid.	Asked.
Mexican dollars	$0.44¾	$0.48¾
Peruvian soles and Chilean pesos	.41¾	.45¾
Victoria soverigns	4.85	4.87
Twenty francs	3.87	3.90
Spanish 25 pesetas	4.78	4.82

Other Metals.

Daily Prices of Metals in New York.

March.	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. Cts. per lb.	Spelter New York, Cts. per lb.	Spelter St. Louis, Cts. per lb.
16	15¼ @15⅜	15¼ @15½	68½	29⅛	4.45	6.10	5.95
17	15¼ @15⅜	15⅜ @15½	68⅝	29⅛	4.45	6.05	5.90
18	15¼ @15⅜	15⅜ @15½	..	29⅛	4.45	6.05	5.90
20	15¼ @15⅜	15⅜ @15½	68½	29¾	4.50	6 @6.05	5.85 @5.90
21	15¼ @15⅜	15⅜ @15½	68½	29¾	4.50	6 @6.05	5.85 @5.90
22	15¼ @15⅜	15⅜ @15½	68	29⅞ @29⅞	4.50	6 @6 05	5.85 @5.90

London quotations are per Long Ton (2,440 lbs.) standard copper, which is now the equivalent of the former g. m. b's. The New York quotations for electrolytic copper are for cokes, ingots or wirebars. Cathodes are usually 0.25c. below the price for electrolytic.

SILVER AND STERLING EXCHANGE.

March	Sterling Exchange.	Silver. New York. Cents.	Silver. London. Pence.	March	Sterling Exchange.	Silver. New York. Cents.	Silver. London. Pence.
16	4.8660	58	26¾	20	4.86¼	58	26¾
17	4.86¼	57⅞	26 11/16	21	4.86	58¼	26⅝
18	4.86¼	57⅞	26 9/16	22	4.8595	58¼	26⅞

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, .925 fine.

Copper.—During the week under review the market has continued strong, and a large business has been done for both home trade and export. It is reported that most of the producers are well sold out for some time to come. The market closes unchanged, at 15¼@15⅜ for Lake; 15⅛@15¼ for electrolytic, in ingots, cakes and wirebars; 14⅞@15, in cathodes; 14¾@14⅞ for casting copper.

Realizing sales have caused a further reaction in the standard market in London, and the closing quotations on Wednesday are cabled as £68 for spot, £68 7s. 6d. for three months.

Statistics for the first half of the current month show a decrease in the visible supplies of 16 tons.

Refined and manufactured sorts we quote: English tough, £71@£71 10s.; best selected, £72 5s.@£72 15s.; strong sheets, £80; India sheets, £76; yellow metal, 6¾d.

Exports of copper from New York and Baltimore for the week ending March 21 were 4,592 tons. Imports for the week of March 17 were 21 tons copper.

Imports of copper and copper material into Great Britain, with exports of copper in all forms, for the two months ending February 28, are given below, the totals showing the equivalents in fine copper; the figures are in long tons:

	1904.	1905.	Changes.
Copper Ore	13,138a	16,246	I. 3,108
Matte and precipitate	8,274	10,836	I. 2,562
Fine copper	16,563	13,347	D.3,216
Total imports fine copper	22,014	20,390	D.1,624
Exports	8,500	6,033	D.2,467
Balance of imports	13,514	14,357	I. 843

The United States furnished 5 tons of ore, 447 tons of matte, and 7,089 tons of fine copper in 1905, against 3 tons of ore, 1,132 tons of matte and 9,153 tons of fine copper last year.

Tin.—Domestic buyers are very reluctant to follow the advancing prices in London, and business in this metal during the past week has been rather restricted. The market closes firm, at 29¾@29⅞ for spot, 29⅜@29½ for futures.

The London market, which closed last week at £135 5s. for spot, £134 for three months, opened on Monday at about the same figures, and at the close on Wednesday the quotations are cabled as £136 5s. for spot, £134 10s. for three months. The extreme backwardation indicates the rather speculative position of the spot market.

Imports of tin into Great Britain, with re-exports of imported tin, for the two months ending February 28, were as follows, in long tons:

	1904.	1905.	Changes.
Straits	3,575	5,841	I. 2,266
Australia	587	652	I. 65
Other countries	616	117	D. 499
Total imports	4,778	6,610	I. 1,832
Re-exports	3,638	5,805	I. 2,167
Net imports	1,140	805	D. 335

The re-exports are largely of Straits tin to the United States, the metal coming to British ports in transit.

Lead.—The event of the week was an advance of $1 a ton, established by the American Smelting & Refining Co. in their schedule of prices. A large business has been doing previous to and since the advance took place, and the market closes firm, at 4.42½ St. Louis, 4.50 New York.

There has also been a better feeling shown abroad, and with the warmer weather it is expected that the improvement will make further headway. Quotations at the close are cabled as £12 8s. 9d. for Spanish lead, £12 11s. 3d. for English lead.

Imports and exports of lead in Great Britain for the two months ending February 28 were as follows, in long tons:

	1904.	1905.	Changes.
United States	4,614	3,118	D.1,496
Spain	16,735	17,486	I. 751
Australia	12,432	19,191	I. 6,759
Germany	2,595	2,521	D. 74
Other countries	2,556	344	D.2,212
Total imports	38,932	42,660	I. 3,728
Exports	6,360	5,864	D. 496
Balance	32,572	36,796	I. 4,224

The lead credited to the United States is chiefly Mexican lead, refined here in bond.

St. Louis Lead Market.—The John Wahl Commission Co. telegraphs us as follows: Lead is stronger and higher. The latest sales are at 4.42½c. for desilverized and common Missouri brands. Missouri refined has brought 4.47½c., East St. Louis.

Spanish Lead Market.—Messrs. Barrington & Holt report from Cartagena, Spain, under date of March 4, that silver has been 14.75 reales per oz. Exchange is 33.14 pesetas to £1. Pig lead is quoted at 66.75 reales per quintal, which, on current exchange, is equal to £11 5s. per long ton, f. o. b. Cartagena. Exports for the week were 250 tons to Amsterdam, and 64 tons to Marseilles, all desilverized.

Spelter.—A total absence of demand, on the one hand, and lower ore prices, on the other, have had a very depressing effect upon the market. Some weak sellers have been compelled to sacrifice their holdings, causing a crumbling away of prices to 5.85@5.90, St. Louis; 6@6.05, New York.

The foreign market is also rather weaker, and closes at £23 7s. 6d. for good ordinaries, £23 12s. 6d. for specials.

Imports and exports of spelter in Great Britain for the two months ending February 28 were as follows, in long tons:

	1904.	1905.	Changes.
Spelter	13,593	14,386	I. 793
Zinc sheets	3,376	3,074	D. 302
Total imports	16,969	17,460	I. 491
Exports	1,174	1,274	I. 100
Balance	15,795	16.186	I. 391

There was very little change in this metal, although demand has been active and prices high this year.

St. Louis Spelter Market.—The John Wahl Commission Co. telegraphs us as follows: The demoralization in spelter continues, and sales have been made as low as 5.85c., East St. Louis, for prompt and nearby delivery.

Spanish Zinc Ore Market.—Messrs. Barrington & Holt report from Cartagena, Spain, under date of March 4, that local prices are steady at 75 fr. for blende, 35% zinc, and 54 fr. for calamine, 30% zinc. Business is rather quiet at present. Shipments for the week were 3,800 tons blende to Antwerp.

Antimony.—The market is somewhat firmer, and there has been a steady demand for the outside brands, at 7½@7⅝ cents.

Nickel.—Producers quote 40@47c. per lb. for large quantities down to ton lots, according to size and terms of order. The price for smaller lots is higher, according to quantity, running up to 60c. for small orders.

Platinum.—Quotations are firm at $21 per ounce. Gas engine sparking points vary from 87c. each for "A," to $1.80 for "B."

Platinum in manufactured forms is strong. Messrs Eimer & Amend, of New York, quote for different forms as follows: Heavy sheet and rod, 75c. per gram; foil and wire, 80c.; crucibles and dishes, 85c.; perforated ware, 90c., and cones, $1 per gram.

Quicksilver.—Quicksilver is easy, at $38 @$38.50 per flask in large lots, while $40 is the price for smaller orders. San Francisco prices are lower, $37.50@$39 per flask being quoted for domestic orders, with some discount for export. The London price is better, at £7 15s., with the same figures quoted by second hands.

Imports of quicksilver in Great Britain for the two months ending Feb. 28 were 63,850 lb. in 1904, and 381,920 lb. in 1905; an increase of 318,070 lb. Re-exports of foreign metal were 341,058 lb. in 1904 and 393,880 lb. in 1905; an increase of 52,822 lb. this year.

Cadmium.—Metallic cadmium, guaranteed 99.5%, is selling in quantities of 100 kgs. or over at 710 marks per 100 kgs., packing included, f. o. b. Hamburg. This is equivalent to 76.6c. per lb. Prices are for net cash.

	Per lb.
Aluminum.	
No. 1, 99% ingots	33@37c.
No. 2, 99% ingots	31@34c.
Rolled Sheets	4c. up.
Aluminum-Bronze	20@23c.
Nickel-alum	33@39c.
Bismuth	$2.10
Chromium, pure (N. Y.)	80c.
Copper, red oxide	50c.
Ferro-Molybdenum (50%)	$1.00
Ferro-Titanium (20@25% N. Y.)	75c.
Ferro-Chrom. (74%)	12½c.
Ferro-Tungsten (37%)	45c.
Magnesium, pure (N. Y.)	$1.60
Manganese, (98@99% N. Y.)	75c.
Manganese Cu., (30@70% N. Y.)	40c.
Molybdenum, (98@99% N. Y.)	$2.75
Phosphorus, foreign	45c.
Phosphorus, American	70c.
Tungsten (best)	$1.25

Missouri Ore Market. March 18.

The zinc ore producers of the district have accepted a steadily declining market prie for their ore for several weeks, until it has been reduced $10 per ton. At the close of January zinc ore sold as high as $60 per ton. The highest price the past week was $50 per ton, and the assay basis price was $43@$46 per ton of 60% zinc. It is now rumored that the producers will try concerted action against further reductions in the price. In 1899 the Missouri & Kansas Zinc Miners' Association adopted a schedule of prices for zinc ore, based on seven times as much in dollars per ton for the ore as the spelter market was in cents per 100 pounds in St. Louis. In 1900 there was a revised schedule issued, the latter approved by several of the smelters. The association schedule puts the price at $43 per ton of 60% zinc with a St. Louis spelter market of $6.15 per 100 lb. The later schedule differed very little, placing 60% zinc at $42.39 per ton on the same spelter market. Producers, having since learned that the ratio in Europe is practically equivalent to eight times as much for the ore in tons as the spelter is per hundred, are expressing themselves as dissatisfied with the continued reductions in the price of ore, and it is probable that some action will be taken to prevent at least further declining prices. If necessary, the output can be restricted 40%. As the smelters were short of ore during the cold, hard winter that tied up operations in this district, and none of them have now a large stock on hand, it would seem that they have pursued a near-sighted policy in reducing prices to a point that may again curtail the output. It would seem that they would rather have the present large output continued at least until their stocks were replenished. With the average cost of outputting zinc ore at $30@$32 per ton, it will be seen that it is necessary that some action be taken before prices are crowded down to the expense line.

Lead ore is selling steadily at $57 per ton, with very little competitive bidding.

Following are the shipments of zinc and lead for the week:

	Zinc lb.	Lead lb.	Value.
Joplin	3,008,690	287,650	$80,400
Carterville and Webb City	1,782,260	378,700	50,000
Galena-Empire	1,039,900	139,390	26,840
Duenweg	826,120	162,470	23,630
Badger	589,340	20,530	14,530
Neck City	518,540	.....	12,960
Aurora	616,000	.....	12,820
Alba	277,810	.....	6,950
Granby	380,000	27,000	6,150
Sherwood	220,820	22,570	5,930
Prosperity	59,020	152,120	5,690
Oronogo	238,420	4,960	5,670
Carthage	200,310	10,960	5,110
Spurgeon and Spring City	252,010	4,690	4,840
Central City	162,880	.....	3,580
Zincite	140,860	3,740	3,485
Beef Branch	198,920	22,590	2,370
Diamond	66,920	.....	1,600
Carl Junction	43,360	.....	1,040
Totals	10,622,180	1,237,370	$273,595
11 weeks	90,943,700	10,491,330	$2,596,830

Zinc value, the week, $238,640; 11 weeks, $2,292,040. Lead value, the week, $34,955; 11 weeks, $304,790.

Monthly Average Prices of Metals.

SILVER.

Month.	New York.		London.	
	1904.	1905.	1904.	1905.
January	57.055	60.690	26.423	27.930
February	57.592	61.023	26.665	28.047
March	56.741	.....	26.164	.....
April	54.202	.....	24.974	.....
May	55.430	.....	25.578	.....
June	55.673	.....	25.644	.....
July	58.095	.....	26.760	.....
August	57.806	.....	26.591	.....
September	57.120	.....	26.349	.....
October	57.923	.....	26.760	.....
November	58.453	.....	26.952	.....
December	60.563	.....	27.930	.....
Year	57.221	.....	26.399	.....

The New York prices are per fine ounce; the London quotation is per standard ounce, .925 fine.

COPPER IN NEW YORK.

Month.	Electrolytic.		Lake.	
	1904.	1905.	1904.	1905.
January	12.410	15.008	12.553	15.128
February	12.063	15.011	12.245	15.136
March	12.299	.....	12.551	.....
April	12.923	.....	13.120	.....
May	12.758	.....	13.000	.....
June	12.269	.....	12.399	.....
July	12.380	.....	12.505	.....
August	12.343	.....	12.468	.....
September	12.495	.....	12.620	.....
October	12.993	.....	13.118	.....
November	14.284	.....	14.456	.....
December	14.661	.....	14.849	.....
Year	12.823	.....	12.990	.....

Prices are in cents per pound. Electrolytic quotations are for cakes, ingots or wire bars; cathodes are usually 0.25c lower.

COPPER IN LONDON.

Month.	1904.	1905.	Month.	1904.	1905.
Jan.	57.500	68.262	July.	57.256	.....
Feb.	56.500	67.963	August	56.952	.....
March.	57.321	.....	Sept.	57.645	.....
April.	58.247	.....	Oct.	60.012	.....
May.	57.321	.....	Nov.	65.085	.....
June	56.398	.....	Dec.	66.384	.....
			Av., year	58.857	.....

Prices are in pounds sterling, per long ton of 2,240 lb., standard copper.

TIN IN NEW YORK.

Month.	1904.	1905.	Month.	1904.	1905
Jan.	28.845	29.325	July.	26.573	.....
Feb.	28.087	29.262	August	27.012	.....
March.	28.317	.....	Sept.	27.780	.....
April.	28.132	.....	Oct.	28.596	.....
May.	27.718	.....	Nov.	29.185	.....
June	26.325	.....	Dec.	29.286	.....
			Av., year	27.986	.....

LEAD IN NEW YORK.

Month.	1904.	1905.	Month.	1904.	1905.
Jan.	4.347	4.552	July.	4.192	.....
Feb.	4.375	4.450	August	4.111	.....
March.	4.475	.....	Sept.	4.200	.....
April.	4.475	.....	Oct.	4.200	.....
May.	4. 23	.....	Nov.	4.200	.....
June	4.496	.....	Dec.	4.600	.....
			Av., year	4.309	.....

SPELTER.

Month.	New York.		St. Louis.	
	1904.	1905.	1904.	1905
January	4.863	6.190	4.673	6.032
February	4.916	6.139	4.717	5.989
March	5.057	.....	4.841	.....
April	5.219	.....	5.038	.....
May	5.031	.....	4.853	.....
June	4.760	.....	4.596	.....
July	4.873	.....	4.723	.....
August	4.866	.....	4.716	.....
September	5.046	.....	4.896	.....
October	5.181	.....	5.033	.....
November	5.513	.....	5.363	.....
December	5.872	.....	5.720	.....
Year	5.100	.....	4.931	.....

Dividends.

Company.	Payable.	Rate.	Amount.
‡Am. Agri. Chem., pf.	Apr 1	$3.00	$544,050
†Am Sm. & Ref., com.	Apr. 15	1.25	625,000
†Am. Sm. & Ref., pf.	Apr. 1	1.75	875,000
*Annie Laurie, Utah	Mar. 25	.50	12,500
Calumet & Arizona	Mar. 20	2.00	400,000
†Calumet & Hecla	Mar. 23	15.00	1,500,000
†Central Coal & C., com.	Apr. 15	1.50	76,875
†Central Coal & C., pf.	Apr. 15	1.25	23,438
*Central Lead Mo.	Mar. 28	.50	5,000
*Claremont Oil, Cal	Apr 1	.01	4,500
†Cop. Range Con., Mich.	Apr. 1	1.00	383,781
Cripple Creek Con.	Mar. 25	.005	10,000
†Daly-West, Utah	Mar. 15	.60	108,000
*Elkton Con.,Colo	Mar. 24	.00½	12,500
†Federal Mg.&Sm.,com.	Mar 15	2.50	125,000
†Federal pf.	Mar. 15	1.75	175,000
†General Chemical, pf.	Apr. 1	1.50	150,000
†Gemini-Keystone	Mar. 25	10.00	50,000
Greene Con. Gold	Mar. 25	.20	100,000
†Guggenheim Expl.	Apr. 1	1.75	183,750
Homestake, S. D.	Mar. 25	.50	109,200
Horn Silver, Utah	Mar. 31	.05	20,000
*Lightner, Cal.	Mar. 20	.05	5,113
*Mines Co. of Am	Mar. 20	.01½	30,000
*National Lead, pf.	Mar. 15	1.75	260,820
*New Century Zinc	Apr. 1	.01	1,500
‡New Haven I. & St.	Apr. 6	.15	15,000
*N. Y. & Hond. Rosario	Mar. 25	.10	15,000
*Pacific Coast Borax	Mar. 29	1.00	19,000
Parrot, Mont.	Mar. 13	.50	114,925
*Peerless Oil, Cal	Apr. 1	.14	12,880
†Phila. Gas, com.	May. 1	.75	398,888
*San Francisco Mill, Mex	Mar. 15	.92	5,520
*Santa Maria de la Paz	Mar. 30	2.29	5,496
*San Rafael aviador	Mar. 20	12.81	15,372
*San Rafael, aviado.	Mar. 20	3.66	4,392
*Soledad, Mex.	Mar. 20	9.15	8,784
*Sorpressa, Mex.	Mar. 20	2.29	2,196
‡Sloss-Sheffield St.& I., c.	Apr. 3	2.50	187,500
†Sloss-Sheffield, pf.	Apr. 3	1.75	117,250
*Silver King, Utah	Mar. 25	.66⅔	100,000
†Standard Oil	Mar. 15	15.00	14,550,000
†Tenn. C. & I., com.	May 1	1.00	225,536
*Twenty-eight Oil, Cal.	Apr. 1	.15	9,000
*Union Oil, Cal.	Mar. 20	.50	26,336
†United Gas Imp	Apr. 15	2.00	180,000
*United Petroleum,Cal.	Mar. 20	.80	11,744
†Va.-Carolina Chem., pf.	Apr. 15	2.00	360,000
‡Wolverine, Mich.	Apr. 1	5.00	300,000

*Monthly. †Quarterly. ‡Semi-Annual.

Assessments.

Company.	Delinq.	Sale.	Amt.
Alta-Sierra, Cal.	Mar. 27	Apr. 17	.30
Austrian Syndicate, Cal.	Mar. 27	.....	.00½
Belcher, Nev.	Mar. 15	Apr. 5	.10
Black Rock Copper, Utah	Mar. 7	Mar. 27	.01
Blue Eagle, Utah	Mar. 4	Mar. 25	.00½
Brunswick Con., Cal.	Mar. 21	.....	.03
Centennial Copper, Mich.	Apr. 10	.....	2.00
Centennial Copper, Mich.	Aug. 10	.....	2.00
Cyclone, Utah.	Mar. 13	Mar. 30	.00½
Emerald, Utah	May 14	June 10	.01½
Exchequer, Nev.	Mar. 8	Mar. 29	.05
Great Eastern, Utah	Mar. 15	Apr. 1	.00½
Hale & Norcross, Nev	Mar. 7	Mar. 31	.10
Halifax-Tonopah, Nev.	Mar. 6	Apr. 6	.10
Horn, Cal.	Mar. 25	.....	.01
Idaho, Utah	Mar. 1	Apr. 1	.00½
Jenny Lind, Cal.	Apr. 9	.....	.01
Julia Con., Nev.	Mar. 28	Apr. 18	.03
Little Chief, Utah.	Mar. 6	Mar. 24	.01
Manhattan, Utah	Mar. 10	Mar. 30	.01
Mayflower, Utah.	Mar. 9	Mar. 25	.00½
Mexican, Nev.	Apr. 11	May 2	.15
New Montezuma, Cal.	Apr. 14	.....	.02
Potosi Nev.	Feb. 21	Mar. 15	.10
Reamer Con. Cal	Mar. 31	.....	.10
Reward, Cal.	Apr. 17	.....	.01½
Santa Rita Cal.	Mar. 20	.....	.05
Savage, Nev.	Apr. 7	Apr. 27	.10
Soldan, Cal	Apr. 11	.....	.03
Sonora Quartz Mex.	Mar. 31	.....	.01
Spanish Ridge Cal.	Apr. 13	.....	.05
Spider, Utah	Mar. 30	Apr. 15	.00½
Wabash, Utah.	Mar. 27	Apr. 17	.05
Yellow Jacket, Nev.	Apr. 11	May 16	.10
Yuba Con. Cal	Mar. 20	.....	.02

Colorado Springs (By Telegraph.)

Company	March 20		March 21	
	H.	L.	H.	L.
Anaconda	.19½	.18¾	.....	.....
C. K. & N.	.16½	.16	.....	.....
Cripple Creek Con.	.....	.....	.....	.....
Doctor Jack Pot	.04¼	.04¼	.....	.....
Elkton Con.	.06	.65½	.....	.....
El Paso.	2.05	2.03½	.....	.....
Isabella.	.32	.31½	.....	.....
Moon Anchor.	.06¼	.06¼	.....	.....
Old Gold.	.07¼	.06¾	.....	.....
Portland.	2.01½	2.00	.....	.....
Vindicator Con.	.82	.80	.....	.....
Work	.35½	.35½	.....	.....

STOCK QUOTATIONS.

Salt Lake City.

March 10

Company.	Par Val.	High.	Low.	Shares.
Ajax	$1	17½	.17	400
Beck-Tunnel	1	.09	.09	2,000
Butler-Liberal	1	18	.13½	22.950
Carisa	1	.09½	.09	1,500
Century	1	.05	.05	1,000
Daly	20	2.75	2.75	100
Daly-Judge	20	6.25	6.25	100
Daly-West	20	16.75	16.27½	100
Grand Central	20	3.10	3.00	300
Ingot	1	.02	.01½	2,000
Little Chief	1	.02	.01½	20,000
May Day	25	.13½	.12	9,900
Martha Washington	1	3/16	3/16	4,000
New York Bonanza	1	.55	.44½	19,700
Petro	1	.14½	.14½	500
Silver Shield	5	.13	.11½	6,000
Star Con	1	.14½	14	2.000
Tetro	1	.21½	.20	3,100
Uncle Sam	1	.31½	.29	8,000
Victor Con	1	.04½	.04½	2,000
Victoria	1	1.80	1.80	350
Yankee Con	1	.37	.35½	1,500

Total sales 107,500 shares.

St. Louis, Mo.*

March 18.

Company.	Par Val.	Bid.	Ask.
Am. Nettie, Colo	$10	$0.10	$0.25
Center Creek	10	1.40	1.80
Central Coal & C	100	70.00	71.50
Central C & C., Pf	100	80.00	81.00
Central Lead, Mo	100	120.00	125.00
Columbia Lead Mo	10	.25	1.50
Con. Coal, Ill	100	28.50	31.00
Doe Run Lead, Mo	100	117.50	125.00
Granite Bimet., Mont	10	.33	.38
St. Joe Lead, Mo	10	16.50	17.50

*By our Special Correspondent.

Montreal.*

March 18

Company	Par Val.	High.	Low.	Sales.
Dominion Coal	$100	80.12½	80.00	450
Dominion Coal, Pf	100	72.00	.....	37
Dom. I. & St.	100	24 00	23.50	460
Dom. I. & St., Pf	100	.....	.....	.....
Montreal Steel	100	107.00	105.00	80
Montreal Steel, Pf	100	.....	.....	.....
Nova Scotia St.	100	64.25	63.50	215
N. S. Steel, Pf.	100	.....	.....	.....

*Montreal Stock Exchange.
Total sales, 1,242 shares.

San Francisco.*

March 9.

Company.	Location.	Opening. H.	Opening. L.	Closing. H.	Closing. L.	Sales.
MacNamara	Nev.	.49	.46	.47	.46	20,400
Mont. Tonopah	Nev.	2.90	2.70	2.80	2.75	17,800
Ton. Belmont	Nev.	.....	.....	1.00	.....	1,900
Ton. Midway	Nev.	1.19	107½	1.20	117½	8,900
Ton. Mg. Co.	Nev.	.....	.....	.....	.....	.....
Ton. North Star	Nev.	.50	.33	.57	.....	19,050

*San Francisco & Tonopah Exchange.
Total sales, 68,050 shares.

San Francisco (By Telegraph.)

Company.	March 20	March 21
Belcher	.19	.18
Best & Belcher	.93	.90
Caledonia	.40	.41
Challenge Con	.12	.13
Chollar	.13	.12
Confidence	.62	.65
Con. California & Virginia	1.55	1.50
Crown Point	.06	.07
Gould & Curry	.16	.14
Hale & Norcross	.60	.45
Mexican	1.55	1.45
Ophir	6.75	6.50
Overman	.13	.13
Sierra Nevada	.36	.34
Union Con	.58	.55
Yellow Jacket	.11	.11

New York.

Company.	Par Val.	Mar. 15 H.	Mar. 15 L.	Mar. 16 H.	Mar. 16 L.	Mar. 17 H.	Mar. 17 L.	Mar. 18 H.	Mar. 18 L.	Mar. 20 H.	Mar. 20 L.	Mar. 21 H.	Mar. 21 L.	Sales.
Alice	$25	1.15	1.10	1.10	1.05	1.05	1.00	1.00	...	1.00	...	1.00	...	2,700
Amalgamated	100	81½	79½	80	78½	80½	79½	80	78½	80	78½	81	79½	309,595
Anaconda	25	119	118½	118½	....	118½	115½	117	115½	1.20	117½	120½	119	11,600
Best & Belcher	3	...	...	.92	...	...	...	...	...	...	...	...	...	100
Brunswick	1	...	...	...	...	...	...	.07	...	...	...	...	...	2,000
Caledonia	1	.56	...	...	...	...	...	.58	...	...	...	...	...	300
Challenge	2½	...	...	...	...	...	...	...	...	...	...	...	...	.....
Chollar	2½	...	...	...	...	...	...	...	...	...	...	...	...	.....
Confidence	3	...	...	...	...	...	...	...	...	...	...	...	...	.....
Con. Cal. & Va.	2½	1.70	....	1.70	....	1.70	...	...	...	...	...	1.60	....	650
Daly	20	...	...	...	...	...	...	...	...	...	...	...	...	.....
Elkton Con	1	...	...	.60	....	.61	.60	...	...	.65	...	.68	.66	1,700
Federal Mining and Smelting	100	105½	105	105½	...	...	...	...	...	115	110	...	...	500
Preferred	100	95	94½	95½	94	96	94½	95½	94½	96½	95	96½	95½	18,700
Greene Consolidated Copper	10	29½	28½	29½	28½	29	28½	28½	28½	28⅜	28⅜	28⅜	28⅜	17.100
Greene Consolidated Gold	10	8½	8½	8½	8½	8½	8	8	7½	8	7⅞	7½	7½	16,870
Hale & Norcross	3	...	...	.72	...	...	...	...	...	.70	...	...	...	400
Homestake	100	77	...	...	...	...	...	...	...	...	...	...	...	210
Horn Silver	20	...	...	...	...	...	...	...	...	...	...	...	...	100
Iron Silver	20	...	...	...	...	...	...	...	...	...	...	...	...	.....
Isabella	1	...	...	.33	.32	...	...	...	...	...	...	...	...	1.000
Little Chief	20	...	...	...	...	...	...	...	...	...	...	...	...	.....
Mexican	3	...	...	...	...	...	...	...	...	...	...	1.50	...	200
Mollie Gibson	5	...	...	...	...	...	...	...	...	...	...	...	...	.....
Occidental	3	...	...	...	...	...	...	...	...	...	...	...	...	.....
Ontario	100	...	...	...	...	...	...	4.00	...	...	...	...	...	125
Ophir	3	6.75	...	6.75	...	...	...	...	...	6.75	...	6.75	...	400
Phoenix	1	7	...	...	...	...	...	...	...	...	...	...	...	500
Portland	1	1.90	...	...	...	...	...	1.90	...	1.95	...	...	...	800
Potosi	1	.12	...	...	...	...	...	...	...	...	...	...	...	100
Quicksilver	100	...	...	...	...	...	...	...	...	...	...	...	...	.....
Quicksilver, pf.	100	...	...	...	...	...	...	...	...	...	...	...	...	.....
Savage	3	...	...	.18	...	...	...	...	...	.17	.16	...	...	500
Sierra Nevada	3	.41	.40	...	...	...	...	...	...	...	...	.36	...	600
Silver Hill	1	...	...	...	...	...	...	...	...	...	...	...	...	.....
Standard Con	10	...	...	...	...	...	...	...	...	...	...	...	...	.....
Syndicate	1	...	...	...	...	...	...	...	...	...	...	...	...	.....
Tennessee Copper	25	.32	30½	30½	30	30½	30	29½	29½	...	...	28½	27½	1,950
Union Consolidated	1	...	...	...	...	...	...	...	...	...	...	.60	...	100
United Copper	100	8	7½	7⅞	...	...	...	...	...	7½	...	...	...	800
Utah	1	...	...	...	...	...	...	...	...	...	...	...	...	.....
Yellow Jacket	3	...	...	...	...	...	...	...	...	...	...	...	...	.....

Total sales, 389,600 shares.

Boston.

Company.	Par Val.	Mar. 15 H.	Mar. 15 L.	Mar. 16 H.	Mar. 16 L.	Mar. 17 H.	Mar. 17 L.	Mar. 18 H.	Mar. 18 L.	Mar. 20 H.	Mar. 20 L.	Mar. 21 H.	Mar. 21 L.	Sales.
Adventure Con	$25	6	...	6½	...	6	...	6	...	6	...	6	...	750
Allouez	25	23½	23	23⅜	22½	23	22⅜	22½	22	23	22	23½	23	2,471
Amalgamated	100	81½	79½	80	78½	80½	79½	79½	78½	79½	78½	81	79½	35,806
Am. Z. L. & Sm.	25	...	...	...	...	...	...	...	...	...	...	...	...	.....
Anaconda	25	29½	...	...	...	...	...	...	...	...	...	30	29½	140
Arcadian	25	...	...	...	...	...	...	1½	...	...	...	1½	...	150
Ash Bed	25	1⅜	...	...	...	...	...	...	...	...	...	1½	...	300
Atlantic	25	17½	17	17½	17	17	...	...	...	16½	...	17	...	1,720
Bingham Con	50	33	32½	32½	....	32	...	32	...	...	...	32	...	958
Bonanza Dev. Co	10	85	...	...	...	75	...	...	...	75	...	...	...	650
Boston Con	10	...	...	6⅞	6½	6⅝	....	6½	....	7	6½	6½	6½	545
Calumet & Hecla	25	678	665	...	....	665	....	670	....	670	...	...	...	135
Catalpa	10	...	...	...	...	...	...	10	...	15	...	...	...	1,000
Centennial	25	19½	19½	19½	18	18½	....	18½	18	17½	16	18	17⅛	1,787
Con. Mercur	5	...	...	37	...	...	...	...	...	...	...	...	...	300
Continental Zinc	25	...	...	...	...	...	...	...	...	...	...	...	...	.....
Copper Range	100	†81	...	77⅞	79½	77⅞	76	77	75½	77½	75½	78	77	59,337
Daly-West	20	16½	16½	...	....	16½	....	16	....	16½	16	16	....	656
Elm River	12	3	....	3	....	3	....	...	....	2¼	...	...	....	440
Franklin	25	12	11¼	...	....	11	....	...	....	11	...	11	....	585
Granby Con	10	6½	6½	6⅜	6	6½	6⅛	6⅛	6	6½	6	6⅜	6	14,791
Greene Con	10	29½	29	29⅜	28⅞	29½	28⅜	28⅞	28	28⅜	28⅛	28⅛	28½	8,673
Guanjuato Con	5	4⅞	4⅞	4⅞	4⅞	4⅞	4⅞	4⅞	....	4⅞	....	4⅞	....	1,845
Humboldt	25	...	...	...	...	...	...	...	...	...	...	1⅞	....	100
Isle Royale Con	25	27½	27	27	26½	26½	25	25½	25	25½	25	25½	25	2,506
Mass Con	25	13½	12⅞	12½	12½	12½	11⅞	11⅞	11⅞	11⅞	11⅞	12½	12	2,054
Mayflower	25	1	...	...	...	1⅛	....	...	...	...	...	1⅛	1	205
Michigan	25	15½	15	14½	14	14½	14	14½	14½	14½	14	14½	14⅜	3,605
Mohawk	25	55½	54½	54½	53⅜	54½	53	...	....	53½	52⅜	53½	53	2,766
Montana Coal & Coke	25	3½	3⅜	3½	3⅜	...	...	...	...	3⅜	3⅜	...	...	800
National	25	...	...	...	...	...	...	...	...	...	...	2	....	200
New Idria	5	...	...	...	...	...	...	...	...	...	...	...	...	.....
Old Colony	25	1⅛	...	...	...	...	...	...	...	...	...	...	...	25
Old Dominion	25	27½	....	27½	27	27	....	27½	26	27	26½	27	26½	1,092
Osceola	25	100½	99	99	97	99	97½	99½	97½	99½	97½	101	99½	8,033
Parrot	10	30	28⅞	29½	28⅜	29	28⅜	29	28⅜	28⅜	28	29	28½	306
Phoenix Con	25	3	...	...	...	3	2⅞	3	....	2⅞	2	2⅛	1⅞	3,104
Quincy	25	109	107	106	105	106	105	105	....	105	....	106	104	371
Rhode Island	25	...	...	2	...	...	...	...	...	2⅛	2	1⅞	....	60
Santa Fe	10	...	...	...	...	...	...	...	...	...	...	...	...	.....
Shannon	10	8⅛	8	8	....	8	7⅛	8	7⅛	7⅛	7⅛	7⅛	7⅛	1,445
Tamarack	25	138	135	135	....	135	134	...	...	134½	133½	134	....	334
Tecumseh	25	3½	3	3½	....	3½	....	3	...	...	...	3½	....	805
Tennessee	25	...	...	...	...	...	...	...	...	...	...	...	...	.....
Trinity	25	12½	11½	12	11½	11⅛	11	11½	11	11½	11	11⅛	10⅞	8,585
Union Copper L'd. & Mg	25	...	...	...	...	...	...	...	...	...	...	...	...	.....
United	100	...	...	...	...	...	...	...	...	...	...	...	...	.....
United States	25	27	26½	26½	25½	26	25½	25⅞	25½	25½	25½	26	25½	18,814
U. S. Coal & Oil	25	...	...	...	...	9⅞	9½	9⅞	9½	...	...	9⅞	...	2,270
Utah Con	5	41½	40⅜	41½	41	41½	41	41½	40⅜	41	40½	41½	40⅜	6,006
Victoria	25	5	4⅞	5⅛	4⅞	5	...	...	....	5	4⅜	4⅛	4⅛	755
Winona	25	15	14½	14½	14	14½	14	14	....	14	13½	14	13½	1,395
Wolverine	25	119½	....	114	113	114	113	113	....	112½	112½	112	....	405
Wyandot	25	2½	2⅛	2½	2⅛	2⅛	2	...	....	2⅜	....	2⅛	....	261

Total sales, 199,341 shares. †Ex-Dividend.

STOCK QUOTATIONS.

London (By Cable*).

Company.	Mar. 21 £	s.	d.	Company	Mar. 21 £	s.	d.
Camp Bird	1	11	10½	Esperanza	..	18	9
Con. Gold Fields	7	16	3	Modderfontein	10	8	9
De Beers	17	10	0	Rand Mines	10	16	3
Dolores	1	9	0	Rio Tinto	66	2	6
East Rand	8	4	4½	Simmer & Jack	2	0	0
El Oro	1	4	4½	Tomboy	1	5	0

*Furnished by Wm. P. Bonbright & Co., 24 Broad St., New York

Coal, Iron and Industrial Shares.

Company.	Par Val.	Mar. 15 H.	L.	Mar. 16 H.	L.	Mar. 17 H.	L.	Mar. 18 H.	L.	Mar. 20 H.	L.	Mar. 21 H.	L.	Sales.
Allis-Chalmers	$100	17	....	17	16½	16¾	15¾	16½	16	16¼	16¼	16¼	....	1,800
Preferred	100	60½	60¼	59	....	60⅜	60	....	....	....	....	60	....	800
Am. Agri. Chem.	100	22	20	23	....	....	....	....	....	....	....	24½	24½	850
Preferred	100	....	....	91½	91	....	....	....	....	....	....	....	....	45
Am. Sm. & Ref.	100	102½	100¾	101½	99	103½	99⅜	102½	101½	103¼	102	103½	101½	196,440
Preferred	100	123¼	122¼	122¾	121½	123	121¼	121¼	121	122¼	122	122¾	122½	10,300
Cambria Iron	50	†48½	....	....	....	48½	....	....	....	....	....	48½	....	1,616
Cambria Steel	50	27½	27¼	27⅜	27	27¼	26¾	27	26½	27	26½	27½	27½	13,894
Col. Fuel & Iron.	100	55⅜	53½	55½	52½	54½	53¼	53⅜	52⅜	54¾	52¾	55¼	53½	127,200
Preferred	100	....	....	....	....	....	....	....	....	....	....	....	....	....
Col. & H. C. & I	100	17¾	17⅛	17⅞	17½	17¼	....	17½	17	....	....	....	....	700
General Chem	100	....	....	....	....	....	....	....	....	....	....	....	....	....
Preferred	100	....	....	....	....	....	....	....	....	....	....	....	....	....
Lehigh Nav.	50	106½	....	106	....	106½	106	105½	....	106	....	....	....	161
Mong. R. Coal	100	....	....	10	....	....	....	....	....	....	....	10½	10	35
Preferred	100	28⅞	28⅜	....	....	....	....	28¾	....	28½	....	29½	29	824
National Lead	100	37⅜	36½	36¼	35½	37¼	36¼	37	36½	37⅜	36	38¾	38	41,200
Preferred	100	108½	107½	107	106½	106¾	....	....	....	106½	106	....	....	800
Phila. Nat. Gas	50	47⅜	46¾	46¼	45¾	47	46¼	46¼	46	47⅛	46⅜	47⅛	47	49,176
Preferred	50	....	....	48⅜	....	48½	48	....	....	48	47⅞	48½	....	221
Pittsburg Coal	100	20½	20	20	19½	19½	19¼	19	....	19¼	19	19½	19½	13,181
Preferred	100	79½	78½	79	78	78¾	78¼	78½	78	77½	77	77½	77	3,129
Republic I. & S.	100	20	19½	19¼	18½	19½	19	19¼	18⅞	21	19	21⅜	20½	30,210
Preferred	100	77	76¼	77	76½	77	76¼	76½	76	79½	76½	80	78½	14,800
Sloss Shef. S. & I.	100	89	....	90	89½	....	....	89	....	91½	89½	97	91½	3,100
Preferred	100	....	....	....	....	....	....	....	....	....	....	....	....	....
Standard Oil	100	622½	620	620	617	621	620	....	....	625	625	628	625	372
Tenn. C. I. & R. R.	100	92½	90½	91⅜	89½	91½	89½	89½	88½	87½	87½	94	91½	59,735
U. S. Steel Corp	100	36⅞	36½	36½	35⅝	35⅝	35½	35½	34¾	35⅞	34½	36	35	267,800
Preferred	100	96⅞	96½	96½	95⅝	95⅝	95	95½	94½	95⅝	94½	95⅝	94⅜	146,074
Va. Car. Chem	100	35	34⅜	34⅜	....	35½	35	....	....	34⅜	34⅜	35½	34	4,195
Preferred	100	....	....	106½	....	....	....	107	....	107	....	108	....	940

Total sales, 419,009 shares

Mexico.

March 10.

Company.	Shares Issued.	Prices, Mex. Bid.	Ask.	Company.	Shares Issued.	Prices, Mex. Bid.	Ask.
DURANGO:				San Rafael y An., aviada	1,200	$730	$740
Penoles	2,500	$2,600	$3,000	Soledad, aviada	670	1,260	1,275
San Andres de la Sierra	200	10,000	.....	Sorpresa, aviada	960	305	310
GUANAJUATO:				MEXICO.			
Cinco Senores y An. aviadoras	2,000	15	20	Aldebarren	2,000	16	20
Cinco, Senores y An. aviada	400	32	40	Buen Despacho	3,000	40	48
Providencia, San Juan de la Luz	6,000	155	160	Dos Estrellas	3,000	3,400	3,460
GUERRERO:				La Esperanza (El Oro)	3,000	1,500	1,500
Garduno y Anexas	7,200	31	35	Santa Ana, Esperanza	2,400	30	60
HIDALGO:				NUEVO LEON:			
Amistad y Con	9,600	73	75	La Fraternal	1,000	580	620
Carmen, aviada	1,100	215	230	Norias de Bajan	1,000	700	750
Guadalupe Fresnillo. Mill	1,000	170	200	SAN LUIS POTOSI:			
Guadalupe Fresnillo Mine	1,400	70	80	Concepcion y An.	3,000	20	30
Maravillas y An., aviador	1,680	70	100	El Barreno, aviadora	2,000	94	100
Maravillas el Lobo	1,000	130	180	Sta. Maria de la Paz	9,600	293	295
Refugio, aviada	12,800	5	7	ZACATECAS:			
Sta. Gertrudis y An aviadas	9,600	7	10	Asturiana y An	2,500	8	12
Sta. Gertrudis y An., aviadora	28,800	74	75	Candelaria y Pinos	2,500	45	60
San Rafael y An., Trompillo	1,200	2,130	2 180	San Carlos y Annexas	2,500	15	20
				Sta. Maria de Gaud	2,500	81	85
				MISCELLANEOUS:			
				Bartolome de Medina	2,000	82	87
				Naica (Chihuahua)	100	11,000	13,000
				Natividad (Oxaca) aviadora	1,800	650	750
				San Francisco Hac	6,000	90	92
				Union Hacienda	3,000	320	340

Paris.

March 3.

Company.	Location.	Par value	Latest dividend.	Prices. Opening.	Closing.
		Fr.	Fr.	Fr.	Fr.
Acieries de Creusot	France	2,000	75.00	1.875.00	1.900.00
Anzin, Coal	France	....	290.00	5.750.00	5.810.00
Biache-St. Vaast	France	1,000	160.00	3.605.00	3.605.00
Boleo, c	Lower California	500	104.17	2.730.00	2.740.00
Bruay, Coal	France	400	27.50	735.00	740.00
Courrieres, Coal	France	500	110.00	2.905.00	2.960.00
Escombrera-Bleyberg, s.l.	France	350	35.00	715.25	716.50
Huanchaca, s	Bolivia	125	2.50	89.00	90.75
Laurium, s. l	Greece	500	25.00	335.00	333.00
Malfidano, s	Italy	500	50.00	638.00	638.00
Metaux, Cie. Fran. de	France	500	22.50	530.00	537.00
Mokta-el-Hadid, i. l	Algeria	500	40.00	1.035.00	1.039.00
Nickel, n	N. Caledonia	250	22.50	669.00	661.00
Penarroya, Coal	Spain	500	45.00	1.165.00	1.179.00
Vielle Montagne, s	Belgium	30	30.00	850.00	858.00

London.

March 9.

Company.	Par Val.	Latest dividend. Amt.	Date.	Quotations. Buyers.	Sellers.
American:	£ s.	s. d.		£ s. d.	£ s. d.
Alaska Treadwell	5 0	6 0	Feb., 1905	6 12 6	6 15 0
Anaconda	5 0	2 0	Nov. 1904	6 0 0	6 2 6
Camp Bird	1 0	9	Feb., 1905	1 12 6	1 15 0
Copiapo	2 0	5 0	Oct., 1904	1 8 9	1 11 3
De Lamar	1 0	2 0	Nov., 1904	16 3	18 9
El Oro	1 0	9	July, 1904	1 3 9	1 6 3
Frontino & Bolivia	1 0	rts.	Mar., 1904	16 0	17 0
Le Roi	5 0	5 0	Nov., 1899	13 9	16 3
Le Roi No. 2	5 0	2 0	Jan., 1905	16 3	18 9
Mesquital	1 0	3	Feb., 1903	2 3	2 9
Montana	1 0	6	Apr., 1899	6	1 0
Palmarejo & Mex	1 0	3	Nov., 1904	13 6	14 6
Stratton's Indep'd	1 0	6	Feb., 1905	8 9	9 3
St. John del Rey	1 0	6	Dec., 1904	12 6	13 6
Tomboy	1 0	1 0	Dec., 1904	1 5 0	1 10 0
Tyee	1 0	2 0	Dec., 1904	2 2 6	2 5 0
Utah Con.	1 0	6 0	Jan., 1905	8 5 0	8 10 0
Ymir	1 0	1 0	Mar., 1902	2 6	5 0
European:					
Libiola	5 0	1 6	May, 1904	1 12 6	1 15 0
Linares	3 0	5 0	Sept., 1904	4 0 0	4 5 0
Mason & Barry	1 0	7 0	May, 1904	2 17 6	3 2 6
Rio Tinto	5 0	32 6	Nov., 1904	66 5 0	65 10 0
Rio Tinto, pf	5 0	2 6	Nov., 1904	6 2 6	6 7 6
Tharsis	2 0	7 0	May, 1904	6 6 3	6 8 9
West Australian:					
Associated	1 0	2 6	July, 1904	1 16 3	1 18 9
Cosmopolitan	1 0	1 0	Apr., 1904	5 0	5 6
Golden Horseshoe	5 0	6 0	Nov., 1904	7 5 0	7 7 6
Great Boulder	2	9	Mar., 1905	1 1 9	1 2 3
Gt. Boulder Perse	1 0	9	Mar. 1905	12 3	12 6
Great Fingall	1 0	7 6	Jan., 1905	8 1 3	8 3 9
Ivanhoe	5 0	5 0	Jan. 1905	7 17 6	7 18 9
Kalgurli	1 0	2 6	Apr., 1905	7 7 6	7 10 0
Lake View	1 0	1 6	Oct., 1904	1 1 3	1 2 6
Oroya-Brownhill	1 0	4 0	Mar., 1905	3 11 1	3 12 3
Miscellaneous:					
Brilliant Central	1 0	6	Mar., 1905	10 0	15 0
Brilliant & St. Geo.	10	6	Mar., 1905	15 6	16 6
Briseis Tin	1 0	.....	.....	11 3	12 6
Broken Hill	8	1 6	Feb., 1905	2 1 6	2 2 6
Mt. Lyell	3 0	1 3	Dec., 1904	16 0	17 0
Mt. Morgan	1 0	3	Mar., 1905	2 10 0	2 15 0
Waihi	1 0	2 6	Mar., 1905	6 12 6	6 15 0
Indian:					
Champion Reef	10	1 5	Jan. 1905	1 12 6	1 13 9
Mysore	10	5 6	Mar., 1905	7 1 3	7 3 9
Nundydroog	10	1 6	Mar., 1905	1 8 9	1 11 3
Ooregum	10	9	Dec., 1904	18 6	19 6
Ooregum, pf	10	9	Dec., 1904	1 6 3	1 8 9
South African:					
Angelo	1 0	5 0	Feb., 1905	6 12 6	6 15 0
Bonanza	1 0	7 0	Feb. 1905	18 9	1 1 3
British So. Africa	1 0	rts.	May, 1899	1 15 0	1 16 3
Cape Copper	2 0	6	Jan. 1905	4 6 3	4 8 9
Cape Copper, pf	2 0	6	Jan., 1905	3 15 0	4 0 0
City & Suburban	4 0	6 0	Feb., 1905	5 13 9	5 16 3
Consol. Gold-F'lds.	1 0	2 6	Dec., 1904	7 17 6	8 0 0
Crown Reef	1 0	18 0	Nov., 1904	15 0 0	15 5 0
De Beers, preferred	2 10	10 0	Feb., 1905	18 8 9	18 11 3
De Beers, deferred	2 10	2 0	Feb., 1905	17 18 9	18 1 3
East Rand	1 0	4 0	Feb., 1905	8 6 3	8 8 9
Ferreira	1 0	27 6	Feb., 1905	21 0 0	21 10 0
Geldenhuis	1 0	5 0	Feb., 1905	5 1 3	5 3 9
Geduld	1 0	rts.	Mar., 1902	6 18 9	7 1 3
Henry Nourse	1 0	8 0	Feb., 1905	7 15 0	8 0 0
Heriot	1 0	5 0	Sept., 1899	3 15 0	4 0 0
Jubilee	1 0	5 0	Mar. 1905	3 12 6	3 17 6
Jumpers	1 0	2 6	May, 1904	2 2 6	2 5 0
Knights	1 0	.....	.....	5 17 6	6 0 0
Langlaagte	1 0	2 0	Feb., 1905	3 8 9	3 11 3
May	1 0	4 0	Feb., 1905	3 18 9	4 1 3
Meyer & Charlton	1 0	5 0	Feb., 1905	4 18 9	5 1 3
Modderfontein	1 0	rts.	Apr., 1902	10 8 9	10 11 3
Namaqua	2 0	3 0	Dec., 1904	3 13 9	3 16 3
New Goch	1 0	.....	.....	2 16 3	2 18 9
New Kleinfontein	1 0	rts.	Apr., 1902	2 5 0	2 7 6
New Primrose	1 0	3 0	Feb. 1905	3 1 3	3 3 9
Rand	5	5 0	Aug. 1904	10 16 3	10 18 9
Randfontein	1 0	rts.	Apr., 1899	2 17 6	2 18 9
Robinson	5 0	8 0	Feb., 1905	9 10 0	9 15 0
Robinson Deep	1 0	3 0	Aug., 1904	6 5 0	6 7 6
Rose Deep	1 0	3 0	Feb., 1905	8 0 0	8 5 0
Salisbury	1 0	2 0	May., 1905	1 10 0	1 15 0
Sheba	1 0	rts.	Feb. 1904	8 6	9 0
Simmer & Jack	1 0	6	Aug., 1904	2 1 3	2 3 9
Village Main Reef	1 0	4 0	Jan., 1905	6 6 3	6 8 9
Wemmer	1 0	12 6	Dec., 1904	8 0 0	8 10 0

*Ex-dividend.

Ishpeming, Mich.*

Week, March 18.

COMPANY.	Par Val.	High.	Low.	Last Sale.
Black Mountain ($2 paid)	$5	$2.25	$2.25	$2.25
Black Mountain (Full paid)	5	4.75	4.75	4.75
Calumet & Arizona	10	110.00	107.00	107.00
Calumet & Pittsburg	10	43.75	38.50	38.50
Junction Dev. ($11 paid)	15	107.00	97.00	97.00
Lake Superior & Arizona	10	10.00	8.00	9.50
Lake Superior & Pittsburg	10	50.00	45 00	45.50
Pittsburg & Duluth ($8 paid)	15	29.00	26.00	26.00
Pittsburg & Duluth (Full paid)	15	30.50	28.00	28.00
Wolverine & Arizona	10	4.75	4.00	4.25

*By The Wallace H. Hopkins Co.

Questions and Answers.

Queries should relate to matters within our special province, such as mining, metallurgy, chemistry, geology, etc. Preference will be given to topics which seem to be of interest to others beside the inquirer. We cannot give professional advice, which should be obtained from a consulting expert, nor can we give advice about mining companies or mining stock. Brief replies to questions will be welcomed from correspondents. While names will not be published, all inquirers must send their names and addresses. Preference will, of course, always be given to questions submitted by subscribers

Dynamite.—Kindly put us in communication with parties handling or manufacturing machinery for the preparation of dynamite from nitric and sulphuric acid, with silica as a filler and absorbent for the glycerine.—M. B. C.

Answer.—There should be no difficulty in selecting from the advertising pages of the JOURNAL the names of manufacturers of general machinery who would contract to erect a plant such as you desire. Invariably, however, plans are prepared according to individual ideas or patents, and the machinery installed on these principles. The method of manufacturing dynamite in a modern plant is comparatively simple, with perhaps the variation of a casualty from a too energetic mixing. The kieselguhr (infusorial earth) should be dry, free from organic substances and grains of quartz. Moisture and organic matter, however, may be eliminated by burning the kieselguhr in a kiln. The calcined material is then ground and sifted. A mixture of 50 lb. of kieselguhr with 150 lb. of nitro-glycerine, kneaded in a wooden trough, and then squeezed through a coarse sieve, makes dynamite; this is pressed into paper cartridges for use. Of course, the proportion of the respective ingredients used in the manufacture of the dynamite depends upon the explosive power required by consumers. This explanation also applies to dynamite having as an absorbent potassium or sodium nitrate, wood fiber or rosin. It is the trade custom to sell dynamite on the basis of nitro-glycerine present, the percentage of the so-called industrial grades being 20, 30, 40, 50, 60, and 75, prices for which vary from 13 to 21c. per lb. at New York. Glycerine for nitro is worth 11.5 to 11.75c. per lb. at New York; nitric acid, 48° Baumé, 7 to 7.5c. per lb., and sulphuric acid, 66°, $1.20 per 100 lb. Ground kieselguhr is valued according to quality at $20 to $40 per ton, the latter price being quoted on German, which pays a duty of $2 per ton. Of course, there are incidental expenses to be met in operating a dynamite factory, and economy in management will also change the estimated cost of producing. It is safe to say, however, that in America the dynamite industry has become very profitable, yielding substantial dividends on the money invested by the combination, known as the E. I. du Pont de Nemours Powder Company, capitalized at $50,000,000, and the few independent manufacturers.

Baryte and Chrome Ore.—I have deposits of both these minerals, and desire information with regard to their use and value.—B. N.

Answer.—If, as may be judged by your letter, your mineral deposit is in South Dakota, its development would no doubt be handicapped by the limited consumption of baryte and chrome ore in the West, and the high cost of freight to the Eastern markets. Competition is keen at present, especially in chrome ore, which is being imported at prices which rather discourage domestic production even if a large deposit were discovered. Baryte is momentarily in the unfortunate position of being in larger supply than the demand for the lower grades calls; hence prices are comparatively easy. For the prime white baryte, however, requests are urgent and prices good, because the available supply is limited. New York quotations for baryte are: Domestic crude No. 1, $9.75 per short ton; crude No. 2, $8; crude No. 3, $7; floated, $16.75@$18; foreign floated, $18.75@$20.50, and snow-white, $17.25@$18.75 per ton. The consumption of baryte in the United States is something like 65,000 tons anually, principally met by the production of mines in Missouri and Tennessee. The chief uses for this mineral are as an adulterant for white lead; as a filler for cloth and paper; and in the preparation of chemical salts which are marketed at remunerative prices. The consumption of chrome ore in this country amounts annually to between 20,000 and 40,000 tons, satisfied largely by imports, free of duty, from New Caledonia and Turkey. This ore is sold on the basis of 50% chromium oxide, the present price being about $19 per long ton, plus a premium of 40 or 50c. per ton for every unit in excess of 50%. The largest users are the manufacturers of metallic alloys, principally ferro-chrome, which contains about 70% chromium, and chemists who market the various chromium compounds that are employed in calico-printing, in certain forms of electric batteries, and in the preparation of pigments. Chrome ore makes an excellent lining for high-temperature furnaces, and in the form of bricks commands a price of $175 per thousand bricks, f.o.b. Pittsburg, Pa. Consumers and buyers of chrome ore include the Harbison & Walker Company, Pittsburg, Pa.; Baltimore Chrome Works, Baltimore, Md.; Willson Aluminum Company, Kanawha Falls, W. Va.; Chrome Steel Works, Chrome, N. J.; George G. Blackwell, Sons & Company, The Albany, Liverpool, England.

Modern pyrometry uses electricity in registering the results; but all methods should allow of direct comparison, either with actual standards or with calibrated results of those standards.

Recent Legal Decisions.

SPECIALLY REPORTED.

DUTY ON QUARLS — FIRE-BRICK. — "Quarls," so called, are dutiable as firebrick, under paragraph 87 of the tariff act of 1897.—Appeal of Bunker & Company from Collector of Customs at San Francisco; Board of General Appraisers.

DUTY ON GALVANIZED IRON SHEETS.—Galvanized iron sheets, valued at over 3 cents per pound, are dutiable at 45% *ad valorem* under the provisions of paragraph 193, act of July 24, 1897, and at 0.2c. per pound additional under the provisions of paragraph 132 of said act.—Appeal of Meurer Brothers Company from Collector of Customs at New York; Board of General Appraisers.

DUTY ON MACHINED, OR FINISHED, CASTINGS.—Certain cast-iron disks which were parts of diamond cutting or polishing machinery, and which had been taken from the casting mold and machined and finished, were held to have been properly classified as manufactures of metal under paragraph 193, tariff act of 1897.—Appeal of Blumenthal & Company from Collector of Customs at New York; Board of General Appraisers.

DUTY ON STEEL STRIPS.—In construing the provision in paragraph 141, tariff act of 1897, relative to strip steel, "cold rolled, cold hammered, blued, brightened, tempered, or polished by any process to such perfected surface finish or polish better than the grade of cold rolled, smoothed only": Held, that this paragraph does not require that the "better" surface finish or polish must be produced by some process other than cold rolling. Held, also, that this provision does not include certain strip steel not subjected to any other treatment than passage several times through cold rolls, together with the pickling, lime bath, and annealing, incident to the cold-rolling process, there being no proof that the expression "cold rolled, smoothed only," has any general, well-recognized commercial meaning that would exclude such strips, and the practice under former legislation having been not to apply a similar provision to like merchandise.—United States v. Wilckes; United States Circuit Court of Appeals, Second Circuit.

Reinforced concrete is enjoying a growing use, a flooring limit of 25 ft. without a joint being sometimes attained.

Practice is dependent on science for its advancement, but scientific workers too often hesitate to attack metallurgical problems, and to devote the resources of modern investigation to their solution, because they are not aware of the great interest of the physical and chemical problems which are connected with many simple metallurgical processes.

The Creston-Colorado Company.

The operations of this company, controlled by the Mines Company of America, for the fiscal years ending September 30, 1903 and 1904, are summarized as below:

	1903.	1904.
Bullion from mill	$668,121,19	$596,164.30
Bullion from cyanide plant	348,310.28	403,101.19
Concentrates sold	181,833.16	113,192.74
Sundry receipts	18,706.75	32,590.43
Total	$1,216,971.38	$1,145,048.66
Deduct expenses	656,996.22	645,962.45
Total profits	$559,975.16	$499,086.21
Receipts per ton of ore crushed	16.85	16.76
Expenses per ton of ore crushed	9.10	9.45
Profit per ton of ore crushed	$7.75	$7.31
Tons of ore crushed	72,228.20	68,336.00
Tons of sand cyanided	42,048.90	41,840.00
Tons of slime cyanided		3,281.00

Less ore was crushed in the second period than in the first, because of alterations in the mill due to the introduction of cyanidation.

Abstracts of Official Reports.

Daly-West Mining Company.

At the recent annual meeting in Salt Lake, Utah, a report was read, giving particulars of operation of this important Utah mine during the year 1904. The financial report submitted shows that at the end of the year the cash reserve in the hands of the treasurer amounted to $284,-148. The total receipts from all sources amounted to $2,280,139, against $2,643,747 during the year 1903—a decrease of $363,-607. The ores and concentrate marketed brought $1,804,672, and the point is made that the product sold for $4.10 more per ton than the ore produced during the preceding year. Of the regular grade of crude ore, 28,355 dry tons were shipped, which contained 1,023,831 lb. of copper, 11,335,964 lb. of lead, 1,066 oz. gold and 1,578,924 oz. silver, which sold for $885,-169. During the time that the Quincy shaft was operated, 14,440 tons of crude ore, carrying 450,452 lb. of copper, 4,547,-258 lb. of lead, 693 oz. gold and 625,158 oz. silver, were produced and sold for $305,-600. The concentrate produced amounted to 15,207 dry tons, which contained 541,-340 lb. of copper, 9,616,557 lb. of lead, 607 oz. gold and 848,652 oz. silver; this sold for $605,738. The product, which is known as the mill crude and comes from the sorting belts introduced in the plant during the year, amounted to 267 tons, and carried 7,382 lb. of copper, 151,665 lb. of lead, 9 oz. gold and 11,490 oz. silver, for which was received $8,164, or $30.58 per ton, net. The concentrate brought $39.83 per ton; the Quincy crude ore, $21.16, and the crude from the Daly-West proper, $31.22 per ton. The total earnings of the mine since its beginning have been $8,955,-512. The total dividends paid to date aggregate $4,635,000, last year's proportion amounting to $1,044,000. All the earnings, except about $330,000, had been received during the past year. The cash reserve on hand at the end of last year amounted to $170,847 less than it did at the beginning. During the past year $456,898 was expended for labor and salaries.

United States Steel Corporation.

The report of the United States Steel Corporation for the year 1904, like its preceding reports, is to be commended for its very full statement of the operations during the year. The earnings and expenses, with the different charges upon net income, are shown in full detail, and the production of the various and diversified properties of the company is also shown in detail. We may add that the report is brought out at an early period of the year, very promptly indeed, if we consider the vast extent and diversity of the company's business. Owing to the nature of the report and the extent of the operations which it covers, it is difficult to abstract; but we give below, in a form as condensed as possible, a statement of the company's operations during the year.

The balance sheet, in condensed form, is as follows:

Common stock	$508,302,500
Preferred stock	360,281,100
Total stock	$868,583,600
Stocks of subsidiary companies outstanding	96,614
Bond and debenture debt	571 791 341
Mortgages and purchase money obligations	4,454,284
Current liabilities	39,838,254
Sinking and reserve funds	30,263,531
Bond sinking funds	14,621,034
Undivided surplus	61,365,446
Total liabilities	$1,591,014,068
Property account	$1,373,967,046
Deferred charges to operation	5,559,657
Investments, real estate, etc.	1,920,176
Sinking and reserve fund asets	6,958,448
Current assets—inventories, accounts receivable, cash, etc.	202,608,741
Total assets	$1,591,014,068

The report gives the bonded debt, sinking fund values, etc., in full detail. The chief additions during the year were made on account of the purchase of the Clairton Steel property. This involved the payment of $1,000,000 in 5% Steel Corporation bonds, which were bought in the open market for $813,850; and the assumption of bonds and mortgages amounting to $12,896,715, of which $10,230,000 are specifically guaranteed by the Corporation.

The report says: "The aggregate inventories of all properties on Dec. 31, 1904, equaled $94,812,546, a decrease in comparison with Dec. 31, 1903, of $13,163,-977. Nearly one-half of this decrease is in the item of ore, of which commodity there was a considerably lesser tonnage on hand both at the mines, lake docks and at furnaces than at the close of the preceding fiscal year. The inventories of the other commodities show generally a decrease, owing to there being lesser quantities on hand and the fact that the prices at which they are inventoried are somewhat below the Dec. 31, 1903, rates. The smaller volume of business transacted during the fiscal year furnishes an explanation generally for the decrease in the working stocks of some of the raw and semi-finished materials on hand. The increased demand for products which developed in the late fall of 1904 has resulted in the necessity for carrying larger inventory stocks, and considerably more working capital will accordingly be required during 1905.

"Inventory valuations are believed to be conservative. They were taken on the basis of actual purchase or production cost of materials to the respective companies holding the same, unless (as happened in some instances) such cost was above the market value on Dec. 31, 1904, in which cases the market price was used. The aggregate inventory valuation of all raw, partly finished and finished materials produced within the organization is very largely below the market prices on Dec. 31, 1904. No profit is taken up by any one subsidiary company on materials and products of its own production until the same have been shipped to its customers. The inventory valuations include the profits on materials embraced in inventories which have been purchased by one subsidiary company from another, but such profits are segregated and carried in a specific surplus account, not being included in the reported earnings of the entire organization until such profits shall have been converted into cash or a cash asset to the organization. In effect, therefore, the specific surplus account referred to is a guaranty fund for these profits included in inventories, since any of such locked-up profits which may not be realized in cash will be charged to the special surplus fund and not to current earnings or realized surplus."

The general statement of earnings is as follows:

Gross sales and earnings	$444,405,430
Manufacturing cost and working expenses	353,627,315
Net balance	$90,778,115
Rentals and miscellaneous	796,838
Profit on investments, etc.	2,960,111
Total income	$94,535,064
General expenses, taxes, etc	$14,785,396
Interest charges, subsidiary companies	6,573,146
Total charges	$21,358,542
Net earnings for the year	$73,176,522

It is impossible to calculate, with any degree of accuracy, averages on the company's business. It may be said, however, that the gross sales show an average of $65.42 per ton of finished products reported. The manufacturing costs were 79.6% of the gross sales.

The report says: "The expenditures made by all companies during the year for maintenance, renewals and extraordinary replacements, the entire amount of which has been charged to current operating expenses or earnings, equaled the sum of $26,258,372, a decrease in comparison with the outlays during the preceding fiscal year of $8,526,819. Of this total decrease the sum of $3,689,915 was in the

outlays for current and ordinary maintenance. Lesser repairs were necessary because the plants and properties were not operated as continuously as in the previous year. The reduction in the expenditures for extraordinary replacements equaled $4,836,904. The expenditures of this class during the previous year were, however, unusually heavy. Notwithstanding the foregoing reduction, these outlays during the fiscal year 1904 exceeded by $176,081 the similar class of expenditures made during the year 1902. It is always necessary to expend large sums for extraordinary replacements, particularly in connection with the manufacturing properties, owing to the constantly changing methods and processes of manufacture and the rapid deterioration of equipment and facilities required for the heavy class of work on which the mills are largely employed. It is essential that the latest and most approved methods of manufacture be adopted in order to insure the operation of the properties at the minimum cost. All requirements for these purposes it is the policy of the subsidiary companies to pay from and charge to funds established for that purpose by regular provisions from net earnings. The general physical condition of the plants and properties, collectively speaking, at the close of the year was better than ever before. A statement showing the principal items of improvements comprehended in the total outlays for extraordinary improvements is included in the statistical tables printed in the report."

As compared with 1903, the net income given above showed a decrease of $35,994,630, or 33%. The disposition of the net income was as follows:

Net income, as above	$73,176,522
Sinking funds, subsidiary companies	$1,583,117
Depreciation, extinguishment and replacement funds	12,574,211
Interest on Steel Corporation bonds	23,518,293
Sinking fund, Steel Corporation bonds	4,050,000
Various accounts and adjustments	1,183,372
Total charges	$42,908,993
Balance for dividends	$30,267,529
Dividends paid	25,219,677
Undivided earnings	$5,047,852

The dividends paid were 7% on the preferred stock, in four quarterly payments. No dividends were paid on the common stock.

The report says: "The expenditures made by all companies during the year and chargeable to capital account for construction and the acquisition of additional property, less credits for property sold, equaled the sum of $17,957,946. These expenditures comprehend only the actual additions and extensions to the plants and properties. These expenditures should not be confused with those made for extraordinary replacements and improvements, which are paid from and charged direct to funds currently provided from earnings, although in practically every instance such replacements more than replace and actually increase the production or operating capacity and reduce costs. As the element of substitution is involved, they are currently charged off as indicated. The capital expenditures as below represent wholly new and additional property. The capital expenditures for the year are classified by property groups, as follows:

Manufacturing properties	$12,191,596
Coal and coke properties	1,490,502
Ore properties	1,580,656
Transportation properties	2,430,158
Miscellaneous properties	265,034
Total for the year 1904	$17,957,946
Amount expended April 1, 1901, to Jan. 1, 1904	64,585,536
Grand total to Jan. 1. 1905	$82,543,482

"Included in the foregoing grand total is the sum of $10,004,238 expended since Dec. 1, 1902, for completion of the furnaces, steel works and mills of the Union Steel Company and the development of its coal, coke and transportation properties, practically all of which work was under way when the stock of that company was acquired by the Steel Corporation."

The iron ore mined, wholly from the Lake Superior region, compares (in long tons) with the previous year as follows:

	1903.	1904.
Marquette Range	1,412,402	934,512
Menominee Range	2,106,443	1,186,104
Gogebic Range	1,867,856	1,271,831
Vermilion Range	1,918,584	1,056,430
Mesabi Range	8,058,070	6,054,210
Totals	15,363,355	10,503,087

The decrease last year was 4,860,268 tons, or 31.6%. In part this large falling off was due to the heavy stocks of iron ore on the docks and at furnaces, carried over from 1903 to the spring of 1904. Of the total ore mined last year, 57.6% came from the Mesabi range.

The tonnage of other raw materials from the company's properties was as follows:

	1903.	1904.
Coke made	8,658,391	8,652,293
Coal mined	1,120,733	1,998,000
Limestone quarried	1,268,930	1,393,149

The item of coal mined does not include the coal made into coke. If that coal be included, the total quantity of coal from the company's properties was, approximately, 14,976,440 tons last year. The coke output decreased only 6,098 tons; while there were gains in both coal and limestone.

The tonnages of raw iron anl steel reported made are as follows:

	1903.	1904.
Pig iron	7,123,053	7,210,248
Spiegeleisen	121,779	100,025
Ferro-manganese and ferro-silicon	34,409	59,148
Total pig	7,279,241	7,369,421
Bessemer steel	6,191,660	5,427,979
Open-hearth steel	2,976,300	2,978,399
Total steel ingots	9,167,960	8,406,378

There was an increase in pig of 90,180 tons, or 1.2%. The decrease in steel ingots made was 761,582 tons, or 8.3%; this was wholly in bessemer, the open-hearth showing a gain of 2,099 tons. The statement shows that the Corporation's output last year was 44.7% of the total pig iron, 69.1% of the bessemer steel, and 50.4% of the open-hearth steel made in the United States.

The output of finished iron and steel is reported as follows, in long tons:

	1903.	1904.
Steel rails	1,934,315	1,242,646
Blooms, billets, slabs, sheet and tin-plate bars	493,292	932,020
Plates	519,713	404,422
Heavy structural shapes	362,765	313,779
Merchant steel, skelp, h'ps, b'ds, and cotton ties	634,830	577,384
Tubing and pipe	710,555	710,765
Rods	101,699	84,934
Wire and products of wire	1,126,605	1,226,610
Sheets—black, galvanized and tin-plate	763,670	735,482
Finished structural work	469,692	357,488
Angle and splice bars and joints	138,709	72,470
Spikes, bolts, nuts and rivets	53,259	46,003
Axles	119,716	62,981
Sundry iron and steel products	30,059	25,787
Totals	7,458,879	6,792,780

The total decrease in 1904 was 666,099 tons, or 8.9%. The most marked decline was in steel rails. At the close of the year the orders for finished material on hand to be filled reached a total of 4,096,203 tons, an increase of 881,080 tons over the quantity reported at the opening of the year.

Minor products from the company's properties are reported as follows:

	1903.	1904.
Spelter, tons	23,841	29,983
Copperas (iron sulphate), tons	15,407	15,805
Portland cement, bbl.	644,286	539,951

The copperas is a by-product, made in the wire-mills. The cement is made chiefly in the plant attached to the Illinois Steel Works, with slag as a basis.

The average number of employees in the service of the Corporation during the year was as follows:

	1903.	1904.
Manufacturing properties	123,397	110,864
Coal and coke properties	17,873	15,654
Iron ore mines	13,768	8,477
Transportation properties	11,033	10,595
Miscellaneous	1,638	1,753
Totals	167,709	147,343

The decrease last year was 20,366 persons, or 12.1%. The amounts paid for salaries and wages were $120,763,896 in 1903, and $99,778,276 in 1904; a decrease of $20,985,620, or 17.4%. This indicates a somewhat lower average of wages paid.

President Corey's report says: "The depression in the iron and steel trade which, in common with all other lines of business, took place during the summer of 1903, continued until the late fall of 1904. The severity of the changed trade conditions is indicated by the lesser volume of business done for the year, as represented by gross sales and earnings, which show a decrease of 17% in comparison with 1903, and by a falling off of 33% in net earnings. While the total output of manufacturing properties shows a decrease in tonnage of finished products for sale of only about 9%, it will be noted that, except for the increase in blooms, billets, etc., on which the margin of profit is lowest, the percentage of decrease in the aggregate tonnage would have been nearly 15%. In the latter part of the year 1904 there was a marked increase in the volume of business received, and this revival has continued. The tonnage of unfilled orders on the books on Dec. 31, 1904, was 4,696,203 tons of all kinds of manufactured products,

in comparison with 3,215,123 tons at the close of 1903. As shown by the several statements in this report, liberal expenditures have been made by the subsidiary companies during the year for maintenance, improvements and construction, it being the policy to maintain the various plants, mills and properties at the highest state of efficiency. The fact that the properties are in this condition, together with the efficient organization which exists, permits economical operating results and influences largely the net earnings, particularly in periods of depression in business. Notwithstanding the liberal outlay made for improvements, construction and new property during the last and preceding years, large expenditures must be made from time to time in order to keep pace with the growing demands of the country. The unexpended appropriations, which have been authorized for work to be done during the year 1905, equal approximately $31,000,000. Reference was made in the last annual report to the fact that arrangements had been made with the United States Steel Products Export Company, whose capital stock is held by the Federal Steel Company, to act as export selling agent for the several subsidiary companies. Most satisfactory results have been obtained in respect to the export trade. A total of 1,021,672 tons of various products was shipped during the year 1904 for export. One of the essential features in this business is that the average production cost of similar commodities for domestic sale is thereby reduced."

The number of stockholders in the Corporation at the close of 1904, as compared with the number at the end of 1903, was as follows:

	1903.	1904.	Changes.
Preferred	42,720	39,654	D. 3,066
Common	37,237	27,868	D. 9,369
Totals	79,957	67,522	D. 12,435

This indicates a certain degree of concentration of stockholdings during the year. Under the stock-subscription plan offered to employees, there were taken in 1904 a total of 17,973 shares of preferred by 8,429 persons, at $87.50 per share. The number of shares taken in this way, up to the end of 1904, was 97,168 shares of preferred stock, the number of subscriptions being 44,740 in all.

Carbon disulphide is very inflammable and may cause dangerous explosions. Such an accident recently occurred in a factory in England, in connection with work on carbolic acid.

The Simplon tunnel, from Briga in the Rhone valley in Switzerland to Iselle on the Italian side, is 19,770 m. (a little over 12 miles) long. The Mt. Cenis tunnel is 12,800, and the Arlberg, in Tyrol, 10,300 m. long. The cost of the Simplon tunnel was $15,000,000, or a little under $1,240,000 per mile. The last part of the rock was pierced on February 24, 1905.

An Improved Hydraulic Giant.

Since the hydraulic giant was first introduced in mining in California, many improvements have been made. The latest which we have to record is the addition of a safety attachment to the double-jointed ball-bearing giant, made by the Joshua-Hendy Machine Works, of San Francisco. The Bouery safety attachment, which is patented, adds materially to the efficiency of the giant, because it insures the safety of the operator, and permits work to proceed without interruption on account of breakage.

It is well known that in hydraulic mining a high pressure is always necessary, and this must be increased where gravels are encountered, which are partly cemented and require great force to insure their disintegration, while the giant must frequently be placed at a considerable distance from the bank or wall of gravel. All managers of hydraulic mines know that, under these conditions, it is frequently the case that the men directing the stream are afraid of the breaking of the giant; consequently, they are continually watching the machine rather than the bank, their attention being drawn from the spot most demanding it in order that the best results may be obtained. The effect of this is obvious, and it generally happens that the duty of the miner's inch of water becomes considerably reduced.

There are many objections to increasing the strength of a giant by making it heavier. The Bouery safety attachment makes the breaking of a giant by working pressure impossible in a simple and effective way. The operator feels secure against accident, and can, therefore, give his entire time to guiding the stream and making it do the maximum amount of work. A case in point is found on the works of La Grange Hydraulic Gold Mining Company, at Minersville, Trinity county, Cal., where four of these improved giants are working under pressures varying from 450 to 550 ft. The manager of the company states that since their installation they have not had to stop one minute on account of accident, and adds: "My mind is now relieved of the feeling of the responsibility, which I consider an important matter to a mine manager."

Complete information and descriptions of this attachment can be obtained by applying to the Joshua-Hendy Machine Works, of San Francisco, California.

GIANT WITH BOUERY SAFETY ATTACHMENT.

Marconi, of wireless telegraph fame, has patented a recording device whereby the receiving speed has been increased from 24 to 100 words per minute.

The tantalum filament in the Siemens and Halske incandescent lamp, on long service, tends to become granular and irregular, as though made of beads. This is due to the semi-fusion of the metal.

TELLURIDE OF MERCURY.—This is a common mineral in several lodes at Kalgoorlie, Western Australia. At the Oroya-Brownhill mine there is so much of it in the ore that half a bucket of mercury is obtained when retorting the zinc slime from the precipitation boxes of the slime (cyanide) plant. No mercury is used in the slime part referred to. The mercury secured in this way serves as a supply adequate for amalgamating the roasted concentrate. A specimen of telluride from No. 5 level of the Oroya gave the following results:

No. 1.	Silver-white telluride	Gold	40.0%	Silver	3.0%
" 2.	Tarnish yellow	"	7.2%	"	0.2%
" 3.	Dark, showing black telluride	"	0.5%	"	0.2%

The telluride of mercury tested contained about 60 per cent of mercury, and would be the mineral coloradoite, or the impure variety known as kalgoorlite. No. 1 would be calaverite, while No. 2 was probably coloradoite mixed with some calaverite.

Yabsley & Atkinson Water-Meter.

At the dumps plant of the Crown Reef Gold Mining Company, on the Witwatersrand, an ingenious water-measuring apparatus devised by Messrs. Yabsley and Atkinson, of the engineering staff of the company, is in operation (*Journal*, Chemical, Metallurgical and Mining Society of South Africa, December, 1904). It consists of a wooden box, 50 by 30 by 23 in. deep. At the end where the water flows in there are two breakwaters, so as to insure an undisturbed head of water in the remaining part of the box. At the other end of the box is a thin metal or glass aperture, so designed as to cause the head of water in the box to vary in exactly the same proportion as the quantity of water flowing through the aperture. A glass float is so arranged as to swim on the surface of the water and work a pen or pencil, which, moving in suitable guides, records on a sheet of paper, mounted on a cylinder rotated by clockwork, the varying height of the water and thus the varying flow. The paper is graduated in inches vertically and for hours lengthwise, 24 hours being one revolution. Each inch of height equals 10 tons of water per hour. The paper being 6¾ in. high, the capacity of the meter is 6¾ x 10 x 24 = 1,620 tons per day. At any period of the day it is possible to tell the quantity of water passing, by noting the height of the pencil on the chart. By taking the average height of the diagram with a planimeter and multiplying by the tons per inch, the quantity of water passed in 24 hours is at once ascertained. The error of the meter is said to be practically nil.

Electric Ferro-Silicon.

Messrs. George G. Blackwell, Sons & Company, of Liverpool, England, advise us that their new works for the manufacture of ferro-silicon by electric process will be in operation early in April. These will be the largest works of the kind in existence. The intention is to make three grades of the alloy, 25%, 50% and 70-75%, respectively, all with a very low percentage of phosphorus. Heretofore, it has been difficult to obtain a 50% ferro-silicon in lump grades, as the lumps disintegrate into a coarse powder very soon after it is made. It is claimed that, by the new process, the lumps will remain solid for any length of time.

In the electro-tension series, tantalum stands between platinum and silver, but nearer silver.

Passivity is a fall of the potential of a metal as compared with a normal electrode; iron, chromium, nickel, cobalt, molybdenum, vanadium, tungsten, columbium, ruthenium and others become passive; but uranium and manganese do not show this capacity of lowering their inherent potential.

Patents Relating to Mining and Metallurgy.

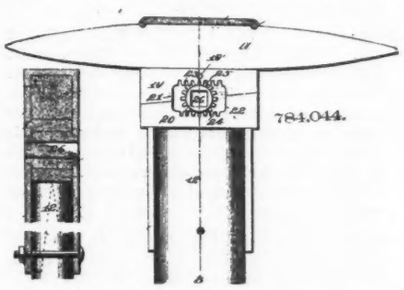
UNITED STATES.

The following is a list of patents relating to mining and metallurgy and kindred subjects, issued by the United States Patent Office. A copy of the specifications of any of these will be mailed by THE ENGINEERING AND MINING JOURNAL upon receipt of 25 cents. In ordering specifications correspondents are requested to name the issue of the JOURNAL in which notice of the patent appeared.

Week ending March 7, 1905.

784,023. APPARATUS FOR CASTING METALS.—Irving Barker, Springfield, Ill. A mandrel for casting metals, consisting of a straight hollow body part smoothly finished externally and having a central bore closed at one end and extending practically the full length of said mandrel, and a straight integral collar smoothly finished externally; in combination with a matrix and means for supporting said mandrel centrally in said matrix; said matrix and mandrel being so constructed and arranged as to produce at one casting an article having a straight smoothly finished bore and a straight smoothly finished counterbore.

784,044. MINER'S PICK.—Martin Hardsocg, Ottumwa, Iowa. A tool, comprising the stem formed with a recess, the pick formed with grooves on one face and mounted in said recess, projections on the stem seated in said grooves of



the pick, and wedge-blocks mounted in the stem, one of the blocks contacting the pick and the other the stem, the wedge-blocks formed with oppositely inclined faces in mutual contact and arranged for opposite rectilinear movement for expansion against said pick and stem respectively.

784,083. BRIQUETTE-PRESS.—John Treadwell, San Francisco, Cal. In a briquette-press, an open-bottomed feed-hopper, a wheel having a peripheral feed-groove and rotating beneath said hopper, transverse molds formed in the rim and opening from said groove, oppositely acting plungers movable in the rim of the wheel, and means for obstructing the feed-groove and so regulating the delivery of material from the feed-groove to the molds formed in the rim.

784,105. DUMPING-CAR.—Walter R. Cliffe, Harrisburg, Pa. The combination of a tilting car-box having a discharge-opening, a movable door closing said opening, arms pivoted to the car-box and connected with said door, a bell-crank lever connected to the car-box and coacting with the door, whereby the movement of the car-box opens the door, a hand-lever suitably supported, and pivoted connections between said hand-lever and the car-box, whereby the movement of the hand-lever tilts the car-box to dump the same and simultaneously opens the door.

784,120. APPARATUS FOR CYANIDE TREATMENT.—Edwin L. Oliver, Oakland, Cal., assignor of one-half to Arthur De Wint Foote, Grass Valley, Cal. An apparatus for the cyanide treatment of gold and silver bearing materials, comprising a tank; an open-topped pipe rising within and opening directly into the upper portion of said tank, the lower end of said pipe having communication with the lower portion of the tank; a connection from a source of compressed air communicating with the lower end of the pipe; anode and cathode plates within the tank; and suitable electrical connections to said plates.

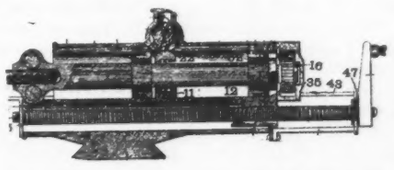
784,122. BLOWING-ENGINE OR COMPRESSOR.—Gustav B. Petsche Philadelphia, Pa. assignor to The Southwark Foundry & Machine Company, Philadelphia, Pa. In a blowing engine, the combination of a delivery-valve with means acting to open said valve when the pressures in the compressing cylinder and receiver are substantially equal, a reciprocating device positively actuated by a moving part of the engine, another reciprocating device acting when moved in one direction to close the valve and when moved in the other direction to leave it free to open, said device moving in a path substantially at right angles to that of the positively actuated device aforesaid, and a link connected with the valve-closing device and connected also to a point on the positively actuated device which moves alternately above and below the link's point of connection with the valve-closing device.

784,124. PROCESS OF HARDENING IRON.—Ferdinand L. Ramon, San Francisco, Cal., assignor of one-half to Percy D. Bailey, San Francisco, Cal. A process of hardening iron which consists in forming an alloy of iron and aluminum by placing the metals in a crucible, heating the same to white heat, then placing on the metals a small quantity of sulphur and reducing such metals to a molten state by the application of additional heat, so as to be ready for pouring for the formation of the finished product.

784,146. MACHINE FOR CONCENTRATING MINERAL ORES.—Gaylen R. Duncan, Three Rivers, Canada, assignor of three-fourths to Drummond, McCall & Company. In a machine of the class described, the combination of a pulp-feed, a wash-water supply and a dropping-pan adapted to supply a shower of drops of water upon the stream of wash-water and the material which has settled on the surface of the machine beneath the stream of wash-water.

784,154. MACHINE FOR FORMING BUILDING-BLOCKS.—Henry Gutteridge and John H. McConnell, Hamiota, Canada. In a machine of the character described, a bed-frame, a slidable table mounted thereon, a core-plate, cores thereon, screw-threaded adjusting-rods for said plate, a matrix-frame, a clamping-yoke adapted to secure said frame in closed position, a resilient plunger, and a plunger-head thereon provided with perforations therein of substantially the contour of said cores.

784,173. ROCK-DRILL.—Cyrus T. McCormick, Fredericktown, Mo. In a drill, the combination with a cylinder provided with a piston and having an open end at one side of said piston, of a



piston-rod for and of less diameter than said piston, projecting through the open end of said cylinder, and means for exhausting motive fluid from the other side of said piston and discharging it into the side of said cylinder having the open end.

784,171. PROCESS OF CARBURIZING STEEL PLATES.—Andrew F. Mitchell, Homestead, Pa., assignor of seven-twentieths to William H. Jones, Homestead, Pa. A process of carburizing armor-plates, which consists in supporting a plate upon refractory material, arranging upon the upper face of said plate a sectional frame or box for confining the carbonaceous material, luting the lower edges of the frame-sections with refractory

material, placing sufficient carbonaceous material within the frame to extend above the upper edge thereof, placing another plate upon the carbonaceous material, luting the upper edges of the frame, between the frame and the upper plate, and submitting plates thus prepared to heat in a furnace.

784,226. ELECTRICAL FUSE PRIMER.—Francis M. Quinn, Silver King, Idaho. An electrical fuse-primer consisting of a wrapper containing a combustible material, the upper portion of the wrapper being split and the combustible material divided to form a passage, an electrical conductor comprising a wire having a portion of high resistance, such portion being disposed in the passage, the split ends of the wrapper being brought together over the wire, and a wrapping of waterproof material surrounding such split portions and the adjacent ends of the electrical conductor and serving to hold all of the parts in proper position.

784,255. PROCESS OF UTILIZING SCALE FROM CALCIUM-CARBIDE INGOTS.—Isaac R. Edmands and Joseph Scales, Saulte Ste. Marie, Mich., assignors to Union Carbide Company, Niagara Falls, N. Y. A process of utilizing the scale from calcium-carbide ingots, which consists in decomposing the carbide therein, and smelting the residue.

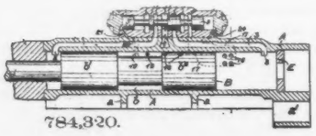
784,268. STONE-CHANNELING MACHINE.—Charles M. Lyman, Rutland, Vt. In a stone-channeling machine, the combination of an upper slide having means for clamping a gang of drills thereto, a lower slide, a feed-screw in threaded engagement with the upper slide and swiveled to the lower slide, and a hand-operable rotary member through which said screw passes, the screw being provided with a longitudinal keyway and said member being provided with a key to fit said keyway.

784,302. COMPOSITION FUEL.—Charles H. Carpenter, South Bend, Ind., assignor to John L. White, South Bend, Ind. A composition for artificial fuel consisting of peat or muck, salt, and powdered rosin, so compressed into a solid mass or compound as to distribute the volatile and resinous matter of the composition throughout the mass and retain the same.

784,307. FEEDING APPARATUS FOR COAL-DUST.—John V. Culliney, Lebanon, Pa., assignor to American Iron & Steel Manufacturing Company, Lebanon, Pa. A feeding apparatus for comminuted fuel comprising a hopper, a conveyer-chamber communicating therewith and provided with a horizontal fuel-delivery passage, an air-conduit chamber located beneath the terminus of said delivery-passage and having transversely alined inlet and outlet air-conduits therefrom, and a conveyer-screw entering said passage and arranged to deliver a falling stream of fuel between said alined inlet and outlet conduits.

784,318. COMPOSITION OF MATTER FOR FORMING PIPES OR TUBES, ETC.—Jerome S. Gregg, Pomona, Mich. A composition of matter for a pipe or tube, comprising cement, sand, resin and water impregnated with liquid glue all mixed together to form a plastic composition.

784,320. VALVE FOR ROCK-DRILLING MACHINES.—James E. H. Grose, Germiston, Transvaal. In a rock-drilling machine or engine,



784,320.

in combination, a cylinder and piston arranged therein, a valve-chest on the cylinder formed with ports placing the interior of the cylinder and the main supply-port in communication with the end of the valve-chest, the other ports placing the center portion of the cylinder in communication with the exhaust-port, other ports placing the interior of the cylinder and the main supply-port in communication with the other end of the valve-chest, the ports being controlled by the piston to alternately close said ports to the exhaust to effect the reversal of the valve.

784,407. PROCESS OF MAKING GAS.—Joannes C. H. Kramers, Mastricht, and Jacobus G. Aarts, Dongen, Netherlands, assignors to Water-Gas-Maatschappy Systeem, Dr. Kramers & Aarts, Amsterdam, Netherlands. A process of making gas which consists in simultaneously firing up a pair of generators to a state of incandescence, supplying fresh coal to the top of the incandescent fuel in one generator, passing steam from beneath the fuel-bed up through said incandescent bed and the freshly supplied fuel, passing the products in the condition in which they arrive from the fuel-bed through a plurality of regenerators capable of fixing and oxidizing the gaseous products and causing a part of the carbon monoxide to react with the excess of steam to form carbon dioxide, and then passing said products downward through the incandescent material in the other generator to reduce the carbon dioxide.

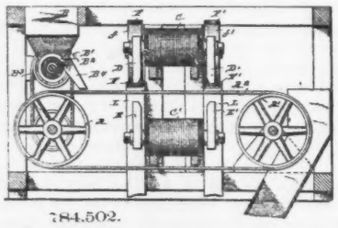
784,435. HYDRAULIC PUMP.—Robert H. Russell, Galveston, Tex. assignor of one-half to Clifton W. Arnold and Walter L. Sheldon, Galveston, Tex. In an apparatus, means for lifting liquid fluid-operated devices for actuating said lifting means, a controller for the feed and exhaust of the fluid to the lifting means, and means operated by the exhaust of said fluid from the device which actuates the lifting means whereby to shift the said controller.

784,454. ELECTRIC HEATER FOR OIL OR GAS WELLS.—Fred B. Waring, Lima, Ohio, assignor of one-half to Ira R. Longsworth, Lima, Ohio. A heater for oil-wells comprising an upper and a lower support, a plurality of tubes connected to said supports, heating devices extending through each of the tubes and connected with an electrical source, and spiders connected with said supports for centering the heating devices within the tubes.

784,470. BRICK-PRESS.—Edgar D. Church, Saginaw, Mich., assignor to The American Sandstone Brick Machinery Company, Saginaw, Mich. In a brick-machine, the combination with a rotary table having mold-cavities therein, of an elongated work member having a bearing-plate intermediate at its ends, plungers arranged for vertical reciprocation within said cavities, and means for depositing plastic material in said cavities.

784,473. BLUE-PRINTING MACHINE.—Edge T. Cope, Salem, Ohio, assignor of one-half to Buckeye Engine Company, Salem, Ohio. In a blue-printing machine, a curved transparent surface a curtain secured at one end, a roller on which the curtain winds, and weighted cables arranged to yieldingly hold the curtain in contact with the surface.

784,502. MAGNETIC ORE-SEPARATOR.—Lewis G. Rowand, Camden, N. J., assignor to



784,502.

Wetherill Separating Company. In a magnetic ore-separator, the combination of a conveyer-belt adapted to convey the material to be treated, of magnets above and below said belt, the pole-pieces of opposite magnets being in proximity to the conveyer-belt, the upper magnet having the stronger magnetic field.

784,515. METAL-CUTTING MACHINE.—Albert C. Calkins, Los Angeles, Cal., assignor to The Calkins Company, Los Angeles, Cal. In a sheet-metal-cutting machine, a hollow mandrel constructed to receive sheet material, means for circulating a refrigerating fluid therethrough, mechanism for revolving the mandrel, cutting devices and instrumentalities for simultaneously progressing said devices against the ends of the material upon said mandrel.

GREAT BRITAIN.

The following is a list of patents published by the British Patent Office on subjects connected with mining and metallurgy.

Week Ending February 18, 1905.

18,176 of 1904. ROCK DRILL VALVE.—W. Jenkin, Redruth. Improved arrangement of the valves for compressed-air rock drills.

19,142 of 1904. CONCENTRATING SLIME.—E. J. Swyny and S. G. Plucknett, Sydney, N.S.W. The application of the inventor's vibrating settling tank for concentrating zinc-lead sulphide slimes.

27,563 of 1904. GUIDE-ROPE ATTACHMENT.—H. W. Becker and R. F. Williams, Cardiff. Improved holding device for suspending the guide-ropes in mine shafts.

Week ending February 25, 1905.

1,793 of 1904. DEEP-BORING DRILL.—J. Koster, Limburg, Holland. In deep-boring apparatus, improved mechanism for obtaining a maximum acceleration of the stroke of the boring tool.

2,443 of 1904. DEEP-BORING APPARATUS.—E. Frich and R. Nottenburg, Nordhausen, Germany. Improvements in deep-boring apparatus, actuated by solenoids fixed to the boring tool.

4,793 of 1904. OIL CONCENTRATION.—J. D. Wolf, London. Passing ores through petroleum mixed with other oils and chloride of sulphide, and afterwards removing any gangue taken up by passing through warm water.

5,041 of 1904. SMELTING FURNACE.—M. Moore and T. J. Heskett, Melbourne, Australia. A continuous furnace for smelting iron sands by the action of carbonic oxide or hydrocarbon gases.

6,784 of 1904. STAMP MILL.—C. H. Maunder and T. Bowhay, Tavistock. A stamp mill in which the stamps are suspended from pivoted horizontal levers, the other ends of which are depressed by cams.

9,964 of 1904. ELECTRIC ROCK DRILL.—P. Centner, Verviers, Belgium. An improved reciprocating drill operated by a moving magnetic field.

23,906 of 1904. OIL CONCENTRATION.—A. Schwarz, New York, U. S. A. Adding fatty substances to petroleum, and also sulphur compounds, in order to increase the efficiency of the process for concentrating ores by means of oil.

24,585 of 1904. TREATING COPPER ORE.—G. H. Blenkinsop, Swansea. A process for treating silicious and friable copper ores, consisting in removing as much sulphide by water concentration as possible, roasting the residue and lixiviating with sulphate of iron, thus producing copper in the form of sulphate.

25,948 of 1904. ELECTRIC FURNACE.—Société Electrometallurgique Francaise, Froges, France. Improved electric furnace for manufacturing steel from mixtures of cast iron and scrap iron and steel.

27,186. VALVE FOR ROCK DRILLS.—Ingersoll-Sergeant Drill Company, New York, U. S. A. Improved valve mechanism for hammer drills.

27,857 of 1904. MAGNESITE BRICK.—M. Gerster and H. Freund & Sons, Budapest, Improved method of making bricks from magnesite.

27,865 of 1904. PRODUCING ALUMINUM.—H. S. Blackmore, New York, U. S. A. Producing aluminum by heating alumina with acetylene and a small portion of powdered magnesium.

Special Correspondence.

San Francisco. March 14.

The United States has obtained an injunction from the United States Circuit Court against the Mountain Copper Co.'s operation of the extensive smelting plant at Keswick, Shasta county. The case has been going on for about seven years, the claim of the government being that the operation of the smelting plant did great damage to the vegetation on public lands in the neighborhood. On the other hand, the company denied great damage, contending that it was slight, and that the granting of the injunction would ruin its business. The contention that the sulphurous fumes should be condemned and the vegetation thus saved was opposed by the company on the ground that this was impracticable. Meantime, however, the company became aware that in all probability this suit would result adversely to its interests, and has started building a new plant on the shores of San Francisco bay, above Martinez, the intention being to bring the more highly sulphuretted ores to that point by rail and there reduce them. Part of the Keswick plant was closed down, leaving only one furnace running, and the headquarters of the company were removed to San Francisco.

The Mountain Copper Co. has the most extensive reduction plant connected with the mines on the Pacific Coast. Its annual output has been running up in copper, gold and silver to between $2,000,000 and $3,000,000 annually. The operations have kept Shasta county in the lead of mineral production in California for several years. Hundreds of claims or mines have been opened and operated by reason of the presence of the smelters in the county and affording a ready market for ores. Neighboring counties have also profited by this. Miners could operate without capital and without individual reduction works, merely mining their ores and selling for prompt cash. This has made a very prosperous mining community in Shasta, but the closing of the smelter by injunction may end all this. The company has been continually harassed by small suits at law from farmers or horticulturists, and has bought some thousands of acres of land to avoid further suits. It was alleged damage to the government timber lands at a distance which has finally brought about the injunction. A stay of proceedings of 10 days has been granted, and the company will doubtless put up bonds to cover all damage. But at the same time it is very unlikely that the Keswick plant will ever be operated on so grand a scale as heretofore, and much of the work will hereafter be done at the new plant near Martinez.

And here again there is likely to be trouble from the same cause to some extent, though the new works are to make sulphuric acid from hte fumes. Still, only this week a move has been commenced against the Selby Smelting Co., whose works are about as far below Martinez, on the bay shore, as the Mountain Copper Co.'s new works are above that town. The farmers, orchardists and land owners of the vicinity are banding together to commence action against the Selby people for destruction to vegetation by smelter fumes. The government takes no hand in this latter action, owning no lands there. The lands all belong to private parties. The Selby is the largest Western smelting plant on the Pacific Coast, and the oldest. Unlike the Mountain Copper Co., the Selby Smelting & Lead Co. owns no mines. It receives ores of all kinds from all over the coast, however, and does a very extensive business in their reduction. The works have been gradually enlarged and improved so that they are modern in every respect. The manager, Alfred von der Ropp, is a skilled metallurgist, and has made the works very successful. In handling sulphurets, the company has been able to show the gold mine owners that this can be done cheaper at the Selby works than at the mines, so that nearly all the separate chlorination plants have been given up. Only this week the Utica Mining Co., of Calaveras county, abandoned its own chlorination plant, and has commenced to ship the sulphurets to Selby's.

It will thus be noted that the two largest smelting plants in California, and on the Pacific Coast, are having trouble about their fumes. The hydraulic miners of California have had their troubles, which still continue; the gold dredger men are just beginning theirs; and now the smelter people have questions in dispute.

Denver. March 17.

It is generally understood that the mine managers at Telluride will shortly adopt the card system, whereby no application for employment will be considered unless accompanied by a card of recommendation issued by the Mine Owners' Association.

According to the report of Commissioner White of the Colorado Bureau of Mines, this State produced $2,617,649 more gold in 1904 than during the preceding year, while there was a decrease of the value of silver amounting to $263,554. The value of zinc produced in 1904 amounted to $3,313,787.

On April 1 the Colorado Springs Short Line, as it has been known since its construction, will be merged with the Colorado & Southern railway system, which will thereby gain an entrance in the Cripple Creek district. Orders have been issued that in the future all passenger and freight traffic for Colorado Springs and the Cripple Creek district via the Colorado & Southern must be routed via the Short Line.

The payrolls of the American Smelting & Refining Co. at Pueblo for the month of February amounted to about $150,000, distributed among its four plants. The ore supply of the Philadelphia plant was somewhat short during that month in consequence of winter weather interfering with the mining operations in districts from which the copper ores to be treated at that smelter are shipped.

For several months the properties of the Boston-Colorado Coal Co. and the South Canon Supply Co., near Glenwood Springs, have been in the hands of a receiver, and in order to wind up his affairs they have been ordered sold on April 12 by the district court. A new company will be organized, the debts paid by the original stockholders, and development resumed.

Almost all the grading on the Moffat line from Arrowhead, its present terminus, to Hot Sulphur Springs, in Grand county, has been completed, and in about a month the laying of the track is expected to commence, in order, if possible, to have trains run into Hot Sulphur Springs by July 1. The latter point promises to become a great health resort, with its mineral waters, which have, until the event of a railroad, been inaccessible except by a long stage ride.

After a long-drawn-out investigation on the part of a committee from the joint legislature, J. H. Peabody was declared elected Governor on March 16. It had been previously arranged, however, that he would resign on March 16 in favor of Jesse L. McDonald, the properly elected Lieutenant-Governor. He was sworn in as Governor to-day. Thus the peculiar situation occurred of a State having virtually three different governors in 24 hours, as Governor Adams had been inaugurated and served until March 16 at four o'clock, when Peabody was sworn in. This puts an end to this controversy, during which the utter rottenness of the last November election was exposed and a great deal of bitter feeling engendered between the opposing factions. Governor Adams deserves praise for the way he has acted throughout the contest. He was advised by many of his friends to hold his office by force, but he states that he never for a moment had an idea of accepting such advice. Now that this serious problem is solved, it is to be hoped that the State government will go along smoothly, and that the legislature which, although about two-thirds of the time allotted for its work has passed without hardly anything being accomplished, will settle down to work and enact the necessary legislation.

Scranton. March 20.

The strike at the Silverbrook colliery at Wilkes-Barre has ended. Two men were discharged from the mine owing to some paltry offense and the miners struck. The local committee reported that the discharged employees were reinstated, and the strikers returned to work.

The supply store and compressor house of the West Moreland colliery at Wilkes-Barre were destroyed by fire on March 10. The origin of the fire is unknown.

Charles P. Neill, the sliding-scale commissioner, has informed the members of the United Mine Workers that the miners are entitled to an increase of 6% in their wages for the month of February, the price of coal at tide water being $4.84. For the corresponding month last year the increase was 7 per cent.

The boards of three anthracite districts, which met at Hazleton on March 13, decided to send out circulars calling upon the men to mark Saturday, April 1, the anniversary of the adoption of the eight-hour schedule in the bituminous coal field, as a red letter day by remaining idle. It was also decided by the executive boards to hold a joint convention of the miners of the anthracite region before the next annual convention. At this convention the demands of the union will be definitely formulated. There is hardly reason to doubt that one of these demands will be for an eight-hour day.

The verdict of the coroner's jury over the victims of the Clear Spring disaster at Pittston exonerates the officials of the company from all blame. The jury found that the breaking of the rope and the wreckage of the carriage was due to some unknown cause.

The new breaker of the Delaware & Hudson company that has been erected in the side of the old Black Diamond, situated a short distance from Wilkes-Barre, will be operated by electricity. The mine is already worked by that power.

Colonel Jigaroskey, a Russian Pole, is making an extensive inspection of the mines and mining operations of the anthracite coal fields. He will prepare, he states, a full report of his experience and observations for his government when he returns home.

As announced some time ago, the Diamond colliery, one of the oldest in the anthracite region, will be entirely rebuilt

on the most modern lines. Now that the weather is favorable, work will begin upon it at once. Two shafts are to be sunk to the lowest veins of coal in connection with it. These are known as the Dunmore veins, and some of the coal has been already reached. The new breaker will be supplied with patent pickers. The old breaker will continue working, while the one is in the course of construction.

The Pennsylvania Coal Company will suspend operations at the Central colliery, Old Forge, for three weeks, for the purpose of making repairs to the shaft. The tower of the Law shaft will be raised several feet, so that cars can be sent direct from the head of the shaft to the breaker. A new set of boilers is also being installed in the boiler house. New hoisting power is being placed at the Central colliery, Avoca. At the Old Forge collieries a tunnel is being driven into the mountain side for the purpose of reaching the two veins of coal which have not yet been reached. Considerable progress is being made with the drainage tunnel which is being driven from Green Ridge to the Dunmore collieries. So far, more than 2,000 ft. have been driven. It will require fully 12 months to complete the work.

In the Shaleen case the decision of the district court, which was given last week, and in which the constitutionality of the miners' certificate law was supported, notice of an appeal has been filed, as was expected. This will take the case to the supreme court of the State. In the Shea case, which like the Shaleen case, was a suit brought against the miner for working without a certificate, the contention is altogether parallel. The defendant is represented by the attorneys for the Delaware & Hudson Co., for whom the man was working. In this case a motion was made last week to transfer the suit to the federal court, on the ground that the defense depends upon the claim that the Pennsylvania law is in contravention of the fourteenth amendment to the United States Constitution. The court heard the argument, and took the papers on this motion, reserving its decision.

Duluth. March 20.

The entire stock of the Jackson Iron Co. has been transferred to the Cleveland Cliffs Iron Co., for a relatively small consideration. There are 20,000 acres of land, some on the ore formation, the old and abandoned mine, and the old Negaunee concentrating works. There is much low grade ores still in the mines, and the time will come, sooner, perhaps, than has been anticipated, when these ores will be of value. The price paid for Jackson stock was quite small, and in very great contrast to the years when the mine was paying annually an enormous dividend. In several particulars the Jackson is most notable. It was the original discovery of iron by white men in the Lake Superior region, was the first to be formed as a mining company, first to be worked, and first from whose ores iron was made on the shores of the lake. The excellence of its product early served to establish the reputation of Lake Superior ores, and the magnitude of its shipments and the wonderful financial success of the company directed attention to this region that resulted in widening the interest and fixing the interest of the mining world. It stimulated exploration, the investment of capital, immigration and the settlement of the shores of Lake Superior, and was the most potent factor in the building of the Sault canal. The first regular shipments of Jackson ore began the year after the Sault was completed, 1856, and that year amounted to 5,000 tons. Until 1864 the Jackson, Cleveland and Lake Superior were the only shippers. Geologically, the formation at Jackson is of great irregularity, and the occurrence of ore deposits was largely a matter of conjecture, and their continuance when found was determined only by the workings. In 1881 the company built a concentrating works for crushing the rock of waste dumps and that obtained from the jasper walls of the mine, and to separate out and save the ore contained therein. This works did duty a few years, but has long been idle.

John T. Jones, of Iron Mountain, has organized the Empire Iron Co., to operate iron ore lands near Palmer, on the Cascade range, south of Marquette. Very good ore outcrops in a wide ledge on the tract to be explored. Mr. Jones has also let contracts for the diamond drill exploration of lands near Iron Mountain belonging to the Houghton Mineral Land & Mining Co., and the work is to be done by E. J. Longyear, of the Mesabi district. Very deep holes will be driven in the hope of cutting the Chapin ore deposit. Mr. Jones has the idea that this deposit folds to the north, and that this fold can be cut at depth just south of Lake Antoin.

The Cleveland Cliffs Iron Co. has brought the town of Bay Mills and the business good will, and stocks of the extensive lumbering firm of Hall & Munson, operating with headquarters at Bay Mills. The price is $375,000, and the deal includes 95,000 acres of land, which the companys wants for its hardwood timber, etc.

It is understood that the United States Steel Corporation is making figures on the cost of extending the Duluth, Missabe & Northern road from Hibbing terminus to the Mississippi river, a distance of about 32 miles. The extension will be along the ore-bearing range, and will tap the lands of the Canisteo Mining Co. and those of others that the Steel Corporation has recently acquired. There is no doubt in the minds of those who have watched developments that the road will be built, and that it will be ready for business the whole length of the extension in a year from now. The Steel Corporation has within the past few months secured additional ore reserves in that district that may possibly amount to not less than 100,000,000 tons—even more, possibly—when development work has proved up the value of the properties. These include not alone the Canisteo, but the Arcturus, the Diamond, and many tracts that have been acquired separately and from time to time within the past six months.

Salt Lake City. March 17.

It is expected that work will soon be started on the plans of the proposed 100-ton mill to be built by the Boston Consolidated Mining Co. of Bingham. The drawing of the plans will be under the supervision of A. J. Bettles, chief metallurgist on the staff of Samuel Newhouse. Shipments of ore to the smelters are being made at the rate of 150 tons a day, but this is soon to be increased to 300 tons. Connections have been made between the Peabody and Work tunnels, and the mine is in excellent shape for the extraction of a large tonnage. The ore to receive attention in the mill, when completed, will come from the copper-bearing porphyries, which are being developed in preparation for it. For the entire distance that the tunnel has been run in the porphyries—175 ft.—the copper values average from 1.9 to 2 per cent.

George K. Fischer, constructing engineer, has announced that the plans are well in hand for the concentrating plant to be built by the United States Mining Co. for the reduction of its low-grade lead ores. The plant, Mr. Fischer states, will have an initial capacity for the treatment of 100 tons a day, but it is likely that other units will be added at no distant day.

The application filed in the United States Circuit Court of Appeals in St. Louis for a rehearing of the case of the United States Mining Co., appellant, vs. Leonidas M. Lawson et al., involving title to the Kempton lode mining claim in the camp of Bingham, which has a purported value ranging anywhere from $1,500 to $2,000,000, has been denied, the court directing some changes in the opinion filed on November 23, 1904. The case will now be carried to the United States Supreme Court.

The deal for the purchase of the Ohio copper mine at Bingham has not been consummated, but is still pending. The option does not expire until May.

The several smelting companies operating in the Salt Lake valley are still prosecuting work on their experimental plants being built with a view of controlling the fumes. Several new damage cases have been filed during the week against the Utah Consolidated, but no move has been made toward filing the threatened injunction suit.

The Bingham Consolidated management is seriously considering a proposition to roast its sulphide ores in camp before shipment to the smelter as one means of removing existing difficulties.

Spokane. March 15.

Gov. Gooding of Idaho has vetoed the bill prohibiting mining companies from acquiring or disposing of mining property without the consent of two-thirds of the stockholders. He wrote: "A law that would remove from the hands of the officers of a mining company the right to purchase additional property which is often necessary to protect their interests in the purchase of a millsite, rights of way or adjacent property without first obtaining consent of two-thirds of the stockholders, who are frequently scattered all over the United States, would entail great expense and delay and retard the growth of the great mining interest that is doing so much for the development of our State."

Silver-lead properties are forging rapidly ahead at Murray, Idaho, which achieved fame as a gold-placer camp in 1883-5. The Idaho-Montana Summit Mining Co., controlled by Charles Manly, has rich galena ore in its Black Horse mine on Paragon gulch, six miles east of Murray. The strike was made six weeks ago in a curly tunnel about 300 ft. long and 70 ft. deep. The miners followed a small seam which showed carbonate carrying 80% lead and 5½ oz. silver. The ledge showed from 4 to 5 ft. of galena, carrying values similar to the carbonate. The shoot has been penetrated 40 ft., and about 100 tons of ore has been sacked. A car of 30 tons was shipped to Colorado. It was hauled 22 miles over two high passes to the railway, at a cost of $10 a ton. There is much activity among the silver-lead properties there, and mining men are working to secure an extension of the Oregon Railway & Navigation Co.'s road from Kingston, Idaho, 35 miles away over good grades.

The Mascot Mining Co., promoted by C. S. Crysler, has started its third season of gold dredging on Trail creek, near Murray, Idaho. Smith & Dunlop are working with 12 men on Eagle creek in the same camp.

The Salzer-Ford cyanide plant at Black Lake, Idaho, has been running steadily since its completion last fall.

D. C. Nevin, of the Iron Springs Co., near Council, Idaho, announces that the company will put in a 100-ton cyanide plant on its Rapid river properties.

It is reported that the Ladd Metals Co. has purchased the entire holdings of the American Mining Co. at Seven Devils. The Ladd smelter at Landore, Idaho, is closed.

W. M. Crummer, lately of Republic, Wash., has been in the city on his way to Organ, N. M., to fill an engagement with the Stephenson-Bennett Silver-lead Mining Co. He will recruit a working force at San Francisco. The mine is being equipped with new machinery.

The orebody in the deep level of the Bunker Hill & Sullivan mine at Wardner, Idaho, is 400 ft. long, and at one point is 120 ft. wide. Fully half is shipping ore. This is at a depth of 2,500 to 3,000 ft. on the vein.

Excellent specimens of galena are found in the Moonlight group, near the Hercules, at Burke, Ida. The strike, 400 ft. deep, has widened from 18 in. to the full face. The tunnel, 1,100 ft. long, has been under way two and a half years.

The recent discovery of rich silver-lead ore in the Black Horse mine, near Murray, Ida., is one of the important developments in the recent history of the Cœur d'Alenes. A shipment of 30 tons is being taken out. A drift of 40 ft. showed an increase in ore from 18 in. to 7 ft. Other Murray properties are active. The new concentrator on the Monarch should start this week. The Bear Top concentrator is to run May 1. At the Golden Chest the capacity of the mill will be increased from 20 to 50 stamps.

Butte. March 15.

The Pittsburg & Montana Co., operating east of the city, has struck a shoot of good copper-silver ore in the Donner vein, on which it is drifting west from the crosscut connecting shafts two and three at a depth of 1,200 ft. The work of mining at this point is retarded by a heavy flow of water. This difficulty will be eventually overcome, for the company is now placing a large pump on the 700-ft. station of Shaft Two, and will soon install another 500 ft. deeper. The machinery of the pumping department is now being run to its capacity, and, barring accident, will hold the inflow in check until the new pumps are ready for work.

The Reins company is again in shape for extracting ore from its mine, and will resume mining operations this week. Its new pump, the capacity of which is 800 gal. per minute, is connected up in running order. With good luck the company will be extracting between 50 and 100 tons of good ore per day within 10 days. It has a six-foot body of high-grade copper-silver ore on the 800, and has cut the same vein on the 600. It is not so wide on the latter level.

Courtney Brothers are developing a group of gold ore claims six miles southeast of Butte. They have 1,000 tons of ore in the bins that averages $14 per ton. This value is not considered high enough to warrant the shipment of the product, but will pay if treated on the ground. It is their intention to arrange for the erection of a concentrator. The ore was extracted in tunnel work alone, no stoping having been done.

The shaft on the Raven mine, owned by the Raven company, has reached a depth of 700 ft., and is to be sent to the 800. This property has been a fairly good producer of high-grade silver-gold ore, but the copper-silver zone is what the company is after. The apex of the zone was struck in the east workings at a depth of 650 ft., and the company is quite positive that it will have a good body of this ore when it reaches the 800.

John Steinbrenner has struck six feet of heavy sulphide ore in the Carbonate Chief mine, at the head of Warm Springs creek, that carries from one and a half to three ounces of gold per ton. He is employing 20 men, and shipping the output to the East Helena smelter.

W. R. Grace, secretary of the Ingersoll-Sargent Drill Co., is inspecting the large copper mines of Butte.

The output of ore in the Butte district this month will be quite heavy, for all of the old mines are in operation. The Speculator company is taking out between 600 and 700 tons of ore per day, an increase of nearly 500 tons over that of six months ago. The reorganization of the Amy and Silversmith company has been postponed until the 25th, on account of the failure of one of the non-resident stockholders to have his stock represented at the meeting scheduled for March 13. This stock will be on hand on the 25th.

Bisbee. March 18.

The continued floods that have crippled railroad service all through this region have had a serious effect upon mine operations. At Cananea the mines of the Greene Copper Co. have feared a famine in supplies and food, as for a week not a freight has gotten through. This is the more surprising as the road is not through gulches, but either on the *mesa* or climbing the sides of San Pedro mountain, and is not subject to flood damage. The roads north are in bad plight, and there is continual news of bridges lost along the Gila. The memory of man does not run back to the time when there have been such rains in southern Arizona at this season of year.

The February production of copper from the mines of this city was 7,085,000 lb. from the Queen and 2,464,000 lb. from the Calumet & Arizona, or at the rate of 117,600,000 lb. from Bisbee alone for the year, and there is no doubt that this rate will be largely exceeded. The Queen is to add still more furnaces, and the Calumet has two new 300-ton stacks that will be running in May or June, thus doubling its capacity. It is very hard to estimate the copper that will be coming out of this district within the next six or eight months, but it should be not less than 13,000,000 lb. a month, if the market remains strong.

Within the past few days the Junction shaft has gone down into ore, and the daily hoist is now largely copper fit for the smelter. Water has been cut in such quantity that the new pumping plant has been started up at full speed. This plant consists of 3,000 gal. a minute in sinkers and two 1,500-gal. and one 500-gal. station pumps, installed on the 770-ft. level in a large station. For the past three weeks the large plant at the Pittsburg has been unable to do more than hold the volume of water coming in there, but with the aid of the Junction it will be able to get down once more. Water in Junction is now about 35 ft. higher than in Pittsburg shaft, but the water rests, not on a level, but on a parabolic curve, based on the resistance of the surrounding rocks. Junction will be shipping ore to smelter as soon as Calumet has furnaces ready for it.

Copper Queen smelters continue their record-breaking production, and are now making copper at the rate of 85,000,000 lb. a year. Contracts for important additions to the machinery and furnace capacity of the smelters have been given recently, and there will be much new machinery in the power house this year. When the smelters were built, last year, room was left for this, and it was the intention to ultimately add much to capacity; but it was not supposed the work would be called for as soon. But the development of the company's mines and the price of copper have been such as to lead to pushing these works very fast.

Shattuck & Arizona has cut carbonate ore at the depth of 525 ft. in its shaft, and is to drift very soon. This was expected at about this depth.

Pittsburg & Duluth has been working in ore for more than a month steadily, and has now cut a new body of pyritic ore in No. 2 cut, about 1,200 ft. from its shaft. The property is proving a far greater mine than the public appreciates.

Goldfield. March 13.

The town is steadily growing. About 70 people come in every day and about 20 go out to the camps in the south. This leaves a daily increase of 50. The camp is now anxiously waiting for the stamp mills, of which there are three. Only one of these mills will have an assay office, a sampler, and mill all in one. This is the Western Reduction Co.'s, which has almost completed a sampler of 100 tons capacity, and will start operations with 10 stamps. The mill contains amalgamating tables of the latest design, concentrating machinery, and slime tables. The company expects to be able to handle as low as $20 ore, but it can be confidently stated that no mill in Goldfield will be able to handle any lower values than that with any profit to the mine owner. The plant owns the deepest well in camp, having gone to the depth of 100 feet. March 1 the Combination mine increased its dividends to 20 per cent.

An oil discovery has been made in southern Nevada. It lies northeast of Ash Meadows 65 miles, and is reached by way of Amargosa, about the 36 degree 45 minute line. Here a great sandstone dike forms a background against which lies an anticline containing immense quantities of fossilized limestone, similar to the Bakersfield oil district. The discovery was made by J. A. McPherson, a West Point graduate in '83, since retired from the army. The Sandstorm property has 17 leases in ore and three strikes have lately been made. This property has been formed into a company and leases at a 20 and 25 per cent royalty, provided the lessees do 54 shifts of work for each month. The lower royalty is paid on ores running less than $100 to the ton. On this stretch of ground the Loftus-Davis lease has ore averaging $350 to the ton, and has recently made a strike of ore that assays $8,000 to the ton. This was, of course, in small quantity. The Kendall lease made a discovery of $200 under the boiler in its engine room, and dug out

as much as possible of it without destroying the foundation of the building, then a shaft was sunk 10 feet outside and the extraction continued.

The Marvin Ish lease on the Black Butte also recently made a strike of considerable value. A ledge was opened up which measured four feet across, and which assayed, the lowest $84 and the highest $226. Another ledge has been picked into about three feet from the original find. There is much shipping ore in sight and a hoist will be erected and a shaft sunk at once. The Tonopah Club property, also owned by the Henry Weber-Ish combination, has one of the peculiar formations of the camp. This is a shale, most hungry-looking to even an experienced eye, which can be kicked out from the bank by the toe of the boot, and which when panned at any point always shows good color. It will run about $65 to the ton. Old miners say that they never saw a formation exactly like it.

There have been five big assays, the least of which was $92.50, which, because of reasons relating to purchase or for similar causes, are not to be made public as yet. It shows, however, that the camp is still open for new finds, and that the values have not by any means been all discovered.

The Bullfrog district to the south of Goldfield looks very promising, and four of its mines have already made their respective owners' fortunes. These are the Lige-Harris group, the Original Bullfrog, the Denver claim, and the Shoshone discovery. The first shipment of ore from the district went through the camp and came from the Original Bullfrog. Its value was $10,000, and it was driven through camp with five armed guards and an orchestral accompaniment.

The little southern Nevada mining camps, a stage journey from Goldfield, are made up of from 100 to 300 inhabitants, all living in tents, altogether, perhaps, a thousand people. These towns are named Rhyolite, Beatty, Amargosa, and Bullfrog, and are soon bound to be known to the general mining world.

Toronto. March 16.

It is claimed that soft coal has been discovered on a farm in Adjala township, Sinicoe county, Ontario. The samples shown burn well and are in appearance similar to ordinary steam coal. The officials of the Bureau of Mines consider that it is quite likely some coal may exist in that neighborhood, as it has been found in small quantities in the drift thereabouts, but are inclined to doubt the commercial value of the discovery, as it is not probable that it occurs in sufficient quantities to pay for operating.

On March 15 a delegation representing the cement manufacturers of Canada had an interview with the Ministers of Finance and Customs at Ottawa, and urged the imposition of an increased duty on portland cement. They complained of the dumping of cement on the market by American manufacturers, stating that the American article was sold in the home market for 30c. per barrel more than the price at which it was offered in Canada, duty paid. They asked that the duty be increased from the present rate of 12½ to 17½ cents, specific duty, per 100 lb. The ministers promised that the matter would receive consideration.

Alfred Thompson, Member of Parliament for the Yukon territory, has taken his seat. He has stated his intention at an early date of pressing for several important changes in the mining regulations of the territory. These include the abolition of the royalties on quartz gold, and on placer mining an enlargement of the size of placer claims, and that the boundaries of mining claims may be more clearly defined. At present placer claims are 250 ft. in width along the stream, and may extend back from 1,000 to 2,000 ft. The change desired is to give all claims a width of 500 ft. along the stream and a depth of 1,000 ft., as it has been found that the extreme length of 2,000 ft. sometimes brings the rear of the claim to another creek, shutting out a prospector. Owing to the fact that boundaries of claims were not defined with sufficient accuracy, many miners have been involved in litigation The provision of the law is that claims should run from rock rim to rock rim, but unless the rock comes to the surface it is difficult to define the line of demarcation. The mining laws of British Columbia, with such modifications as the nature of the country requires, would be perfectly satisfactory to the Yukon miners.

The coal mines at the Joggins, Cumberland, N. S., belonging to the Canada Coal & Railway Co., together with 10 miles of railway connecting the mines with the Intercolonial railway, were sold by the liquidators of the company on March 8 for $50,500 to Stuart Jencks, who acted on behalf of some of the bondholders. The latter hold bonds aggregating $750,000. The company, being heavily over-capitalized, went into liquidation some six months since. In addition to the mines and railway, 19,000 acres of timber lands and 22 miners' cottages were sold for $5,500. It is estimated that $150,000 must be spent in development work before the property will pay for operating. Since 1892 the shipments from the mines have been between 40,000 and 90,000 tons annually.

D. E. Roberts, of the Plymouth Gypsum Co., of Fort Dodge, Ia., which recently bought the Manitoba Union Mining Co.'s property, has returned to Winnipeg from a visit to the works at Gypsumville on Lake Manitoba. He reports that the company is putting in new machinery and expects to have the mill in operation by the middle of April. Ties are being taken out for the construction of a steam tramway from the mines at Gypsum Lake to the mill at Gypsumville, a distance of 11 miles.

Victoria. March 15.

Ainsworth.—Zinc ore continues to reach Kaslo from the Lucky Jim mine, which has shipped about 3,000 tons since work was commenced on it last summer by its owner, Geo. W. Hughes. It is stated that profits on shipments during this period have aggregated $24,000.

Several properties up the south fork of Kaslo creek have been working during the winter. The concentrating mill at the Cork mine is completed, and will be started on the return from Paris of the manager, P. Maris, who has gone to France to consult his principals. The orebody in this mine has been crosscut 70 ft. without reaching either wall. Estimates place the ore in sight at from 150,000 to 250,000 tons. The ore differs from the ordinary Slocan ore, silver values in the large deposit being lower, while lead and zinc are present in about equal parts. The Bismark shipped ore through the winter that returned good profits. Deep snow made it unsafe to continue working, so operations have been suspended until the spring. The Province is still at work, the shaft having been sunk about 70 ft. Good ore has recently been encountered in a cross-cut tunnel. The Pontiac, at Woodberry creek, recently shipped two cars of high-grade ore to the Nelson smelter. Negotiations are proceeding with a view to a resumption of work on the Blue Bell, the earliest discovered lode mine in the province, having been discovered by the celebrated botanist Douglas, long before any mining was done in the Kootenay. In the Summary Report of the Geological Survey of Canada for 1895 it is stated of this mine that "the orebody being worked at present, including some large horses of limestone, measures, approximately, 70 ft. in width by 200 ft. in length and 150 ft. in height. Forty thousand tons of ore have been shipped from this mine during the year, and prodigious quantities remain in sight." When the company owning the mine and the Pilot Bay smelter got into financial difficulties, all its assets passed into the possession of the Bank of Montreal, and both mine and reduction works have been idle for years.

Ymir.—The Second Relief mine, about thirteen miles from Erie, in the Ymir district, has been sold by the Relief Mining Co., the principal stockholders in which were Finch & Campbell, of Spokane, Washington, for $75,000, and a first payment of $20,000 on account has been made. The purchasers have organized a new company called the Second Relief Mining Co., with an authorized capital of $500,000. The officers are: A. B. Cooper, of Erie, B. C., president and treasurer; Geo. H. Barnhart, of Nelson, B. C., late general manager of the Ymir Gold Mines, Ltd., general manager and secretary; O. E. McElfrish, U. S. postal inspector, of Lawrence, Kansas, vice-president, and E. C. Legge, of Nelson, also a director. J. E. Hyde, of Reading, and Senator H. B. Miller, of Osage City, Kansas, are also mentioned as being interested in the purchase. The mine is well equipped, and is opened up by three tunnels, the footage of development work totaling about 3,000 lin. ft. It has its own 10-stamp mill and cyanide plant connected with the mine by a gravity tramway 650 ft. long. About 3,000 tons of ore were milled last year, but a shortness of water, the season having been unusually dry, necessitated a shutdown of the mill in October.

Monterey. March 13.

The first general meeting of mining men ever convened in the Republic of Mexico for the consideration of national questions of importance to the mining industry will be held in Mexico City tomorrow morning in the offices of Attorney Pablo Martinez del Rio. This meeting will be very informal, but it is known that there will be present the most representative mining men, both Mexican and foreign, from all sections of the republic. The principal matters that will be discussed are the effect of the new monetary system on the mining industry, on which Finance Minister Limantour, the author of the financial bill, has invited their discussion; the revision of the mining laws, and the reduction of the burdensome tax on producing mines, both of which are under consideration by the federal government; and the recently imposed duties upon dynamite and explosives, which went into effect the first of this month. It is probable that a memorial will be presented to the President, covering these subjects. It is also more than likely that this informal gathering will lead to a national association of some kind.

Carlos Eisenmann has now a pump working on the unwatering of the Mina de Agua, supposed to be one of the richest abandoned mines in the republic, a short distance to the northwest of Temascaltepec, in the State of Mexico, and at the rate at which the water is being lowered, about four feet a day, it is believed three months will see the workings unwatered.

In Jalisco, E. C. Helm, who came down to Guanajuato, Mex., from New York, to look into the merits of La Luz tunnel scheme in that camp, and withdrew because of unsatisfactory terms, is now said to have purchased from Dwight Furness and associates the Agua Blanca mine, a large and promising copper property in the Ayutha district, on which the Furness people have been working several years.

In Coahuila it is reported that Eduardo Hartman has a $1,000,000 Mexican company formed for the purpose of opening up and developing the coal-fields of La Acujita, near Sabinas.

At the Avino mines, in Durango, the first unit, or half, of the 200-ton lixiviation mill has been completed and will soon be in operation, while Van Voorhis Bros., of Monterey, are busy putting in a 300-h. p. electric plant, to be operated by a Crocker-Wheeler gas engine, which it is believed, located as the Avino mines are, will be a great saving over the steam plant now in use.

London. March 11.

In spite of the bad times in the mining market two new ventures have made their appearance this week, soliciting subscriptions to the shares on the part of the public. One is the Topuldodi (Nizam's) Gold Mines, Limited, which have been formed with a view of developing certain properties in India. It is practically a subsidiary company of the Hyderabad Deccan Co., which has been engaged in mining work in India for 20 years or so. The Topuldodi company has the advantage of including in its directorate two experienced mining men, Mr. Thomas Morgans and Mr. F. W. Grey, and a civil engineer, Mr. Oakley, who is also a director of the Ooregum company.

The other new company to which I refer is the Talana (Natal) Collieries, Limited, which has been formed to acquire the Dudley collieries, near Dundee, in the Natal coal field. This company has also two mining men on its board of directors, Edward Hooper and Robert Addie. In view of the present dullness in the mining market, it will be interesting to hear how the public respond to these two new issues.

The efforts of the South African houses to stir up some interest in their specialties amuse the public considerably. During the past few months we have had important announcements relating to the discovery of banket in Rhodesia, and also of extensive alluvial deposits, and this week we have been treated to a cablegram announcing the occurrence of tellurides on the property of the Rhodesian Banket Co. The actual information is meager in the extreme, but all the same a certain section of the market is ready to enter into a dissertation as to the value and methods of treatment of this class of ore, and to apply the results to the present hypothetical case. Until some exact information comes to hand it is useless speculating as to their value, for previous announcements of the same character mentioned above have had little or nothing of substance at the back of them.

The report of the Mysore Gold Mining Co., Limited, for the year 1904 gives great satisfaction to the shareholders. The ore milled was 191,000 tons, producing 185,725 oz. of bullion, and 154,833 tons of tailing were cyanided, yielding 16,184 oz., so making the total production 201,909 oz., which realized £787,132. The expenditure amounted to £306,000, which, after deducting royalties, leaves a divisible profit of £447,000. During the year the development work kept pace almost exactly with the mills. At the beginning of the year the ore reserves were figured at 510,000 tons, and at the end they were 523,000. In every direction the orebodies continue to open up favorably.

Sydney. Feb. 20.

The gold yield of the State of Queensland for the month of January amounted to 36,453 oz. fine, being 2,091 oz. less than for the same month in 1904. The return from the Charters Towers, Gympie and Mount Morgan fields shows a decline, but the Croydon and Ravenswood fields record satisfactory increases. A rich yield is reported from the mine held by the Great Northern Co. at Coen (Cooktown, Q), 10 cwt. of quartz specimens returning 1,104 oz. of gold, while, judged from assays, the 1,000 tons of quartz raised should average 4 oz. to the ton.

The No. 2 South Great Eastern mine, Gympie, during the past half year crushed 29,532 tons of quartz, for a yield of 23,318 oz. of gold, valued at £83,394, which permitted of dividends to the amount of £48,500 being paid.

The gold yield for the State of New South Wales for the month of January was 34,969 oz. fine, which is well up to the average. The Cobar field contributed an increased output during the year 1904, the production of metal being valued as follows: Gold, £262,212; silver, £5,033; copper, £31,875, or a total of £585,419. This is an increase over the previous year of £92,733. The returns from the Wyalong field are also very encouraging, the output for 1904 amounting to 28,388 oz., valued at £109,993. The True Blue company raised 1,100 tons of sulphide ore, which averaged five ounces to the ton. A parcel of 100 tons of ore taken from the 300-ft. level in the Barrier mine also gave a return of 360 oz. of gold, and equally good returns have been obtained from other mines. These results have naturally given a stimulus to the field, and the numerous mines which were worked to the shallow levels and then abandoned are being reopened.

In the State of Victoria, the matter of how far dredging and sluicing can be carried on without injury to the rivers and the farming community has received investigation at the hands of the Minister for Mines. As the result of his inquiries he expressed himself as convinced that, with proper conditions as to method of working, and by the construction of dredgers of modern type, the beds of the watercourses can not only be worked without injury to the stream and riparian owners, but with positive advantage thereto. In connection with the dredging industry in this State, some interesting statistics have been furnished. It is stated that during the past five years gold to the value of £1,100,000 has been won by the dredgers, and in addition stream tin to the value of £15,000 was obtained. During last year the yield averaged 2.35 grains per cubic yard, or equal to a value of £636 an acre, while dividends to the value of £97,000 were paid.

At the North Lyell copper mine (Tasmania) attention is being directed toward the opening up, by means of a crosscut from the 600-ft. level, of the ore veins previously proved by means of the diamond drill, but owing to the intensely hard nature of the country, progress is very slow. The company's smelting return for the month of January was as follows: Ore treated, 30,683 tons; metal produced—copper, 596 tons; silver, 52,654 oz.; gold, 1,679 oz.

Johannesburg. Feb. 20.

The gold output for January shows a substantial increase of 6,994 oz. for the Transvaal. Most people expected a larger increase than this, but it is probable that some mines held back gold to be declared for February, the worst month in the year for the mining industry. Not only is it the shortest month, but the Chinese holidays greatly reduce the running time of the mills.

We passed through the Chinese New Year without damage. On the whole, the Chinese behaved very well. In fact this is the season when they are on their best behavior, because it is considered very bad form to make a disturbance during this time of peace. The celebrations were a new experience for most of us. All the coolies had a thoroughly good time, and I only wish the irresponsible people who talk of "Chinese slavery" had seen how the Chinamen were treated during their holidays. The sight would have kept them from ever crying "slavery" again. As usual, a large proportion of the white workmen disgraced themselves. The few days' holiday utterly demoralized them. Many "got on the drunk" and came back to work intoxicated. And yet people cry out for an eight-hour day, for freedom for the poor laboring man, etc. With the workmen we often get on the Rand, a holiday means a spree, and the only way to keep them sober is to keep them at work. It makes one "hot" to see the number of incompetent artisans at work, especially on the outside mines, getting a higher pay than in any part of the world, when thousands of first-class men in England and America can hardly find a job. We have our unemployed here also. In fact the class seems to be growing. On account of the intemperance and incompetence of many of them, the problem of their disposal is a difficult one. A strong relief organization keeps many from starvation and want. This charity seems to attract all the "wasters," the "Weary Willies" of South Africa to the Rand. The unemployed cannot compete with the Chinese or Kaffirs in the unskilled labor market. Unless he is a skilled man of some sort, his position is a desperate one. Johannesburg is one of the most intemperate cities in the world, *the* most intemperate city, some people declare. Intemperance among the white men, especially the miners, is sorely felt by the mines of outside districts. Many companies have tried to counteract the evil by putting up large recreation halls, with reading rooms, billiard rooms, bowling alleys, etc. It is found too that much better work is done by married men, who settle on the property, sometimes in houses which they own, than by single men living in quarters. These family men are careful not to give cause for their discharge. It is important to get this steady class of family man settled on the mines, so that there will not be the constant changing of laborers. In the solution of the problem the mines can only play a small part, for it is the province of the government to reduce the cost of living, high rents, etc., so that married men can live with their families.

Personal.

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

Mr. Philip Argall is in Nevada.

Mr. Forbes Rickard is visiting New York.

Mr. George S. Rice, of Chicago, is at Trinidad, Colorado.

Mr. Robert Hay Anderson, of Mexico City, is visiting New York.

Mr. A. C. Hodge has taken charge of the Sansu mine, in Ashanti.

Mr. W. Burrell has been inspecting mines in Western Australia.

Mr. W. L. Austin has returned to New York from British Columbia.

Mr. Richard A. Parker has returned to Denver from the Pacific Coast.

Mr. Arthur L. Pearse returned to London on the *Kronprinz* March 21.

Mr. Henry Phipps, of Pittsburg, is in Mexico City on business and pleasure.

Mr. H. J. Jessop has been examining the Guadalupe mines, at Indé, Mexico.

Mr. G. D. B. Turner has returned to Salt Lake City from a visit to the East.

Mr. Henry W. Arlington has returned to New York from a trip to the West.

Mr. J. P. Cruger is examining the Golden Key mine at Guanacevito, Mexico.

Mr. Edward C. Vigeon, of Anaconda, Mont., leaves shortly for Chagres, Chile.

Mr. T. L. Dawson, manager of the Weihai-wei gold mine, China, is now in London.

Mr. Richard Pearce, who has been at Palm Beach, Florida, is now in New York.

Mr. Henry C. Lay, of Telluride, Colorado, has been visiting New York and Boston.

Mr. Alex Moffat has resigned as superintendent of the Ontario mill, at Park City, Utah.

Mr. Ben S. Rives has returned to Salt Lake City from a month's visit to the Pacific Coast.

Mr. D. W. Shanks, manager of the Almoloya Mining Co., Chihuahua, Mex., is in this country.

Mr. J. B. Du Faur has taken up an appointment at the Mount Morgan gold mine, in Queensland.

Mr. E. J. Wilson has been appointed superintendent of the smelter of the Yampa Co. at Bingham, Utah.

Mr. P. H. Hanson has been appointed superintendent of the Butterfield mine and mill at Bingham, Utah.

Mr. Oscar S. Dawbarn is on his way to Rhodesia, to work with the Rhodesia Exploration & Development Co.

Mr. W. R. Grace, secretary of the Ingersoll-Sargent Drill Co., is inspecting the copper mines at Butte, Montana.

Mr. T. A. Jaggar, of Harvard University, will head a geological expedition to Iceland during the coming summer.

Mr. J. Warne Chenhall has been appointed mine manager under Messrs. Hopkins & Williams, in North Carolina.

Mr. T. Nugent Cosby has left England for Amapala, Honduras, to take up an appointment under the Transito Gold Mines, Ltd.

Mr. Jacob Schriner, Jr., an owner in the Continental mine, at Vulcan, Colorado, has returned to Chicago from a visit to that mine.

Mr. Frank Taylor, superintendent of the Bingham-New Haven mine at Bingham, Utah, is serving the Bingham Central Co. in the same capacity.

Mr. Jesse F. McDonald, who has become governor of Colorado by the resignation of Gov. J. H. Peabody, is a prominent mine owner of Leadville.

Mr. E. J. Laschinger, engineer for the Consolidated Goldfields, Johannesburg, South Africa, is visiting friends in his former home, at Berlin, Ontario.

Mr. George C. Hewett has been examining mines in Almoloya and Indé districts in Mexico, and is spending a week in Prescott, Ariz., on his way home.

Mr. H. E. West, late superintendent of La Leonesa Mining Company, Matagalpa, Nicaragua, has accepted a position on the engineering staff of El Oro mine, Mexico.

Mr. James M. Wheaton has been elected the president of the Gavilanes Mining Co., of Durango, Mexico, to fill the vacancy made by the resignation of C. A. Wightman.

Mr. J. H. Fisk, who has conducted an assay office at Portland, Oregon, since 1870, has become consulting engineer to the Tenderfoot Mining Co. in Malheur county, Oregon.

Mr. Albert Roberts has resigned as assistant superintendent for the Combination Mines Co., at Goldfield, Nevada, and has taken charge of the St. Ives mine at the same place.

Mr. F. Julius Fohs has resigned his position as geologist and mining engineer to the Marion Zinc Co., to accept a position on the Kentucky geological survey. He will take up his new duties April 1.

Mr. W. S. Thyng, mining engineer of Spokane, Wash., is visiting New York this week on business connected with properties of which he has charge. He expects to remain in the East about a month.

Mr. John S. Airheart, consulting engineer to the American-Mexican Exploration & Development Co., recently examined the properties of that company in the San Francisco del Oro district, Mexico.

Mr. Charles H. McMahan has resigned as general superintendent for the Montezuma Lead Co. at Santa Barbara, Chihuahua, Mexico, and will devote his time to private interests and engineering practice.

Mr. D. H. Carpenter has resigned his position as manager of the branch office of the Sullivan Machinery Co., at El Paso, Tex., and has been elected first vice-president of the Humphreys Manufacturing Co., at Mansfield, Ohio.

Mr. Francis A. Thompson, formerly of Gilpin county, Colorado, has been appointed metallurgist-in-chief to the New Western Reduction Co. at Goldfield, Nevada. Mr. Thompson has been superintending the construction of the company's sampler and mill at Goldfield.

Mr. H. C. Riehle, who has for over three years been connected with the management of the Union asbestos mines at Black Lake, Canada, has resigned that position. Mr. Riehle only recently returned from an extended tour through Asiatic Russia, Siberia and Mongolia, where he was examining and reporting upon the various asbestos properties located there.

Obituary.

Frank C. Travers died in New York on March 18, aged 56 years. He was president of the Travers Brothers Co., vice president of the Spanish-American Mining Co., a director in the Merchants' Trust Co., the Franklin Savings bank, the Glamorgan Iron & Steel Co. and the Lynchburg Plow Co.

Charles K. Grenswell, who was identified with Colorado mining interests during the past 20 years, but for the past few years was a resident of San Francisco, where he represented English interests, died suddenly in Denver on March 17, while attending the suit of John B. Hendry against the American Smelting & Refining Co., in which he was a witness.

Meyer Guggenheim, founder of the firm of M. Guggenheim's Sons, and a prominent figure in the mining and smelting industry of this country and Mexico, died at Palm Beach, Florida, March 16, ager 77 years. Mr. Guggenheim was born in Switzerland, and came to this country when 19 years of age. His energy and foresight built up the great enterprises with which he was identified. He leaves seven sons who are now associated in the Guggenheim Exploration Co. and the American Smelting & Refining Company.

Societies and Technical Schools.

Lehigh University.—The register of this institution, at South Bethlehem, Pa. shows that 79 students are at present taking the course in mining engineering.

Society of Chemical Industry.—The New York section has called a meeting for March 24 at the Chemists' Club. Interesting papers on gas as a source of power will be read. 'Producer and Blast Furnace Gases' has been prepared by W. F. Case, and 'Coke Oven Gas' (illustrated by lantern slides) by C. G. Atwater. The subject of the utilization of power gas will be discussed by W. A. Giles, Alex. C. Humphreys, Franz Meyer, Oscar Nagel, F. Schniewind and Edward A. Uehling.

American Chemical Society.—At the regular meeting of the New York section on March 10 the following papers were read: 'The Vapor Friction of Isomeric Ethics,' by Morris Loeb and F. S. M. Pederson; 'The Iodine Absorption of Rosin and Shellac,' by A. C. Langmuir; 'Decomposition of Ammonia at High Temperatures' and 'Mineral Water at the St. Louis Exposition,' by A. A. Breneman.

Joint Summer Course in Geology.—The following summer courses are offered by various institutions. The number of courses offered and the professors, from whom information about them may be obtained, are as follows:

Intercollegiate Appalachian Course, W. B. Clark; University of Chicago, five courses, R. D. Salisbury; Columbia University, one course, A. W. Grabau; Harvard University, three courses, J. B. Woodworth; Johns Hopkins University, one course, W. B. Clark; University of Kansas, one course, E. Haworth; University of Minnesota, two courses, C. W. Hall; University of North Carolina, one course, C. Cobb; Ohio State University, one course, C. S. Prosser; Stanford University, two courses, J. C. Branner; University of Wisconsin, one course, W. H. Hobbs.

Trade Catalogues.

The H. W. Johns-Manville Co., of New York, is sending out a booklet, which describes its packing for flange joint gaskets.

Catalogue No. 7, of the Allentown Rolling Mills, of Allentown, Pa., illustrates and describes that company's well-known line of electric pumps.

Catalogue C, of the Washburn shops of the Worcester Polytechnic Institute, of Worcester, Mass., describes and illustrates the Washburn drill-grinders.

The Murray Iron Works Co., of Burlington, Ia., has prepared two folders, dealing, respectively, with the Murray Corliss engine and the Murray high-pressure boiler.

Lumber carts, trucks of all kinds, steel ore and coal cars and wheels of all kinds, made by the Archer Iron Works, of Chicago, Ill., are described in an attractive catalogue prepared by that company.

The Globe Iron Works, of Stockton, Colo., has issued a new catalogue of Truax automatic ore cars, skips, car wheels, etc. The illustrations show every detail of construction with clearness and fidelity.

The Weber Gas & Gasoline Engine Co., of Kansas City, Mo., has issued a handsome illustrated catalogue of its varied products. Many enthusiastic letters of indorsement of the company's engines are included.

'Compressed Facts about Compressed Air,' is the title of a booklet, issued by the Clayton Air-Compressor Works, of New York. It gives an outline of the points to be considered in buying an air-compressor of medium capacity.

Industrial.

The Isthmian Canal Commission will receive bids for 10,000 bbl. of portland cement, to be employed in the construction of the Panama canal. Communications to be addressed to the Isthmian Canal Commission, Washington, D. C.

The Duff Manufacturing Co., of Pittsburg, Pa., has received a contract for a large quantity of Barrett track jacks for the government railways of Russia. This is the third contract from this source within the year received by the Duff company, and the Barrett jacks have been adopted exclusively by the Russian government for its railroad work.

The S. H. Supply Co., of Denver, is furnishing a large pumping plant, consisting of a large duplex station pump, sinking pump, necessary boiler capacity, water column, steam line, etc., to the Weldon Gold Copper Co. of Arizona. This company is also furnishing a complete diamond drill outfit in California and one in Idaho. This material is all from their stock of slightly-used machinery.

At the regular annual meeting of the stockholders of the Apex Equipment Co. of New York, held March 2, the following officers and directors were elected: Willard U. Taylor, president; Clifton B. Jordan, vice-president and secretary; J. Sterling Drake, treasurer and general manager. M. C. Davis, formerly general manager, is no longer employed by this company, and is not authorized to represent it in any manner whatsoever.

The Sullivan Machinery Co. of Chicago announces the establishment of a new branch office in Salt Lake City, Utah, Room 128, Keith Building. John C. Taylor, formerly of the Denver office, is manager. A full line of Sullivan straight-line air compressors and rock drills with mountings, equipment and duplicate parts, will be carried in stock; and inquiries for diamond core drills, heavy hoisting engines, coal-cutting machines and quarrying machinery will receive prompt attention.

An order for four 4,000 k.w., three-phase, 60-cycle, 6,600-volt, alternating current generators, with exciters, has just been placed with the Crocker-Wheeler Co., of Ampere, N. J., by the trustees of the sanitary district of Chicago. These are to be driven by Wellman-Seaver-Morgan horizontal water wheels, and put in operation at Lockport, Ill., the western end of the Chicago Sanitary & Ship Canal. The two exciters for these machines will be water-wheel driven and of 350 k.w. capacity each at 300 r.p.m.

"There is no valuable feature of the chimney that is not possessed by the fan to at least the same, and in many cases to a more marked, degree. The very features which are most conducive to economy are those which are incidental to the use of the fan for draft production. While the recent extensive introduction of induced draft in stationary practice has done much to emphasize the advantages of this system, the general superiority of mechanical draft, properly applied, has long been recognized by those who have given careful consideration to the matter."—Extract from treatise on Mechanical Draft, published by the B. F. Sturtevant Co., Boston, Mass.

"Artificial draft," states W. S. Hutton, "can be readily adjusted to effect the combustion of different kinds of fuel at different rates of combustion. It permits efficient combustion of fuel of inferior quality, and enables a steady supply of steam to be maintained, independent of climate and weather. It enables the supply of air to be properly distributed to the fuel in the furnace to effect economical combustion. The supply of air above the fuel can be readily adjusted to effect combustion of the gases evolved by the fuel, and the supply of air below the fuel can be regulated to effect the combustion of the solid portion of the fuel, and the movement of the hot gases can be readily controlled.

The contract for the compressed air power plant, to be used in driving the second pair of trolley tunnels under the Hudson river, has been awarded to the Ingersoll-Sergeant Drill Co., which has furnished all the compressors for sub-aqueous tunnel work in New York and vicinity. These tunnels, which are popularly known as the Cortlandt street tunnels, for the reason that their New York terminal will be located on that street, are to be built by the Hudson companies, of which Chas. M. Jacobs is the chief engineer. The shield method of sub-aqueous tunneling will be used. The order includes five duplex air-compressors. Three are low-pressure class "H" machines with steam cylinders 14 and 28 in. in diameter, air cylinders 22¼ in. in diameter and 16 in. stroke, with a maximum air pressure of 50 lb. per square inch and a capacity of 1,850 cu. ft. of free air per minute each. The other two are class "HC" machines for high pressure, with steam cylinders 14 and 28 in. in diameter, air cylinders 24¼ and 14¼ in. in diameter and 16-in. stroke, with a maximum pressure of 125 lb. per square inch and a combined capacity of 2,000 cu. ft. of free air per minute. This makes 38 Ingersoll-Sergeant air-compressors, with a total capacity of 117,234 cu. ft. of free air per minute, now used in building the various tunnels under the Hudson and East rivers.

General Mining News.

ALABAMA.

Gold mining in Alabama is receiving considerable attention, and several Birmingham parties are now pushing development of this line in east Alabama. The Hillabee Gold Mining Co., which is controlled by T. H. Aldrich, Sr., and his son, of Birmingham, is one of the most active gold mining concerns in the Southern States. William Hood and son, also of Birmingham, are pushing work on adjacent goldfields to those of the Hillabee company, while other parties are working lands in Clay, Cleburne and adjoining counties in east Alabama. A smelting plant is needed badly. It is claimed that while the government only gave Alabama credit last year for producing $29,000 worth of gold, that no less than $60,000 worth was produced last year. It is figured that the production this year will be between $75,000 and $90,000. Much of the gold produced in this State last year was sent to smelters in Georgia and other states, the government giving those states credit for the production. The Hillabee company produced last year alone $31,000, which is $2,000 worth more gold than the government gives this state, according to the best information given out here. It is reported that the ores being mined now are running well, and those engaged in this development are pleased at the prospects.

State Mine Inspector J. M. Gray during the past week submitted his report to Acting Governor Cunningham on the explosion which took place in the Virginia mine, in Jefferson county. In all, 111 men lost their lives in this disaster, every man who was at work at the time of the explosion. The chief inspector expresses the belief, from all facts before him and from a personal investigation into the mines, that a windy shot was made by one of the miners in the fifth entry, left, in which too much dynamite or powder was used. This "shot" caused the dust explosion. The mine had been examined several times before, and dates are given of such examinations. The management of the mine was at times notified to make certain changes in the operation of the mine, in order to protect life and property. Accidents from time to time in the mine were investigated, and recommendations made so as to prevent recurrences. The mine was not considered gaseous. The ventilation had been improved. There was a man-way and a main slope. Improvements suggested from time to time by the inspector and his assistants were made by the company. The report of the chief inspector covers investigations made since the mine was first opened.

The damage to the Virginia mine by the explosion was not serious, and in a few weeks it is believed that repairs can be made so that a resumption of work can be had. Commencing March 21, Coroner Paris, of Jefferson county, will begin an investigation to see if there was criminal negligence in the operation of the mine. A large number of witnesses have been summoned, and it is expected that several days will be taken up in making the investigation.

ARIZONA.

COCHISE COUNTY.

Paradise.—At the Lewandowski group which adjoins the Savage on the southeast, S. S. Badger has completed an exhaustive report on the property, and Mr. Lewandowski, the owner, who is now in

the East, will, on his return, break ground for development work.

At the Leadville, Messrs. Snedden and Cox have increased their force and are sinking a shaft to tap an ore shoot that pitches toward it. They report work progressing well.

At the Oregon good headway is being made. Several tons of 16% copper carbonate ore has been taken from the shaft

At the Williams group which adjoins the Cochise Consolidated on the west, J. S. Williams, the owner, has two men working on development, and expects to increase the force in the near future. He has 15 claims in this group.

The Chiricahua Mining Association has been formed, for the express purpose of furnishing reliable information to parties coming into the camp, and to use its best influence in keeping down the usual "wild-catting" that is so injurious to legitimate mining enterprises. Officers of the association are: J. A. Lewandowski president; S. S. Badger, first vice-president; Oscar C. Davis, second vice-president; Richard P. Brown, third vice-president; George A. Walker, secretary and treasurer, and the above officers, with Henry A. James complete the directory of six members.

CALIFORNIA.

AMADOR COUNTY.

Defender.—Men are operating this property on a percentage of the output and have opened a fine ledge of good ore on the 200-ft. drift. The mill is to be started at once.

Alma Mining Co.—This property at Jackson has been idle for some years, but a mill site has been recently purchased, and it is expected that work will be resumed.

CALAVERAS COUNTY.

Sport Hill.—F. O. Courtmarsh, of Mokelumne Hill, has secured this mine and formed a company for working it. The mine will be worked by ground sluicing.

Essex Consolidated Mining Co.—While the shaft of this mine is being unwatered and being put in shape for reopening, tunnel exploration is in progress. The 40-stamp mill is being overhauled. J. Meyers is manager and F. R. Crocker, superintendent.

Stanislaus Mining Co.—This company has been incorporated in Indianapolis, to work the Duchess group of mines at Vallecito, which have been developed by W. E. Emery. A tunnel has been run 1,824 ft., and another one a shorter distance. The vein is a big one, corresponding in character to that of the Melones Mining Co. There is a 10-stamp mill on the property, and ample water power is available.

San Andreas Blue Gravel Mining Co.—The machinery has been started up, and the work of shaft sinking will now proceed.

Duryea.—This mine at Central Hill, D. A. Nuner manager, has now a large force of men. A mill and other machinery is being hauled to the mine.

Benson.—The new 10-stamp mill of this mine has been started up at Altaville. There are four concentrators. A large hoist has been ordered.

EL DORADO COUNTY.

Alpine.—Operations will shortly be resumed on this mine near Georgetown.

Short Handle.—This quartz mine, in Spanish Dry Diggings district, is being unwatered by John Federwitz, who holds it under bond. The property has been idle a number of years.

Clipper.—At this mine near Georgetown, H. G. Koppikus is sinking several prospecting shafts. Negotiations for purchase are pending.

Comet Hill.—The débris dam at this mine, operated by Wm. Weyman & Sons, has been officially examined and approved, and water has been turned on.

Santa Claus Mining Co.—This company was recently organized to work the Santa Claus mine, near Greenwood, F. P. Olcott superintendent. Operations on the property are about to be resumed on an extensive scale.

INYO COUNTY.

Keane Wonder.—This property, in Chloride Cliff district on the southwest side of the Federal range, is being worked under bond by Capt. J. R. De Lamar. The mine is being prospected by two tunnels, 200 ft. apart. Fifteen men are employed. Supplies are hauled in 70 miles, from Ballarat.

KERN COUNTY.

Yellow Aster Mining Co.—Steps are being taken to develop the water supply of this property at Randsburg. They now have sufficient water for the 130 stamps of the two mills, crushing 500 tons a day. A very material increase in the number of stamps will be made should sufficient water be obtained.

MARIPOSA COUNTY.

Omparisa Mining Co.—At this time at Mountain King, the machinery is nearly all in position except the water-wheel. The mill is completed. Seventy-five men are at work. A tunnel is being run to connect the two ledges.

MADEIRA COUNTY.

Numerous placer claims are being taken up along the San Joaquin river, near O'Neals, considerable ground having been located.

Markle.—This mine at O'Neals has been sold for $15,000. The ledge is five feet wide.

Ryan & Sim.—This mine is having development work pushed and a quantity of ore has been blocked out. Some of the ore is high grade.

Yosemite.—A force of men is running a drift, and taking out copper ore which will be shipped to the smelter.

NEVADA COUNTY.

Inkmarque.—Important developments have commenced on this property at Grass Valley, by John Rosenfeld's Sons. The main shaft, now only 160 ft. deep, is to be continued down to 2,000 ft., and levels will be run each 100 ft.; machine drills are used. These mines adjoin the North Star.

PLACER COUNTY.

Star United.—At this mine, Iowa Hill, J. E. Rose superintendent, they have opened up the old tunnel and are running for the back channel.

McGeacham.—This mine, at Iowa Hill, has been bonded by a company of which J. E. Rose is manager. Gravel has been struck and the ground is being opened up for breasting.

Lebanon.—This old tunnel near the Big Dipper, Iowa Hill, is being reopened.

SAN DIEGO COUNTY.

Oroflamme.—This mine in the Julian district has been bonded to the Cuyamaca Co., Geo. H. Clarke, manager.

Cuyamaca Co.—The Stonewall mine, at Cuyamaca, has been unwatered to a depth of about 400 ft. Good ore has been struck in the new shaft.

SHASTA COUNTY.

Black Jack.—A four-stamp mill is to be put up at once on this mine on Mule mountain near Centerville.

Hazel Creek Gold Mining Co.—The Northern California Power Co. is about to extend its lines to the Gladstone mine, French gulch, owned by this company. The Gladstone has its own electrical plant, and will thus have two sources for its power for mine and mill.

SIERRA COUNTY.

Union.—Orrin Sawyer, Geo. L. and Alvin Bancroft have applied to the California Débris Commission for a permit to hydraulic at this mine near Gibsonville, drainage to be into Slate Creek, which reaches the Yuba river.

TUOLUMNE COUNTY.

Columbia.—At this mine they have cut the shoot for which they have been drifting, and the mill will soon be started up.

John Royal.—At this mine, which was recently shut down, it is reported a good shoot of ore has been cut on the 300 level. It is not now probable that the mill will be sold.

Draper.—It is reported that an important strike has been made in this mine, a body of ore having been tapped to the north of the 500 level.

COLORADO.

BOULDER COUNTY.

Venango Mining & Reduction Co.—The property of this company situated at Sunshine was sold this week at sheriff's sale to William J. Bleakely for $4,650.

Prince Albert.—Operations have been resumed at this property at Rowena under management of David Reedy, and preparations are being made to start up the mill this spring. The company has recently been reorganized.

Emancipation.—A number of leasers are working at this property, owned by E. J. Temple, Boulder, and they are keeping up first-class shipments to the smelters, some of the ores carrying high values. The property has a first-class equipment, and complete top buildings and ore-sorting houses.

Gold Nugget.—Development work is being carried on steadily at this property, and the company have decided on improvements at their mill near Rowena before spring, as they have opened up large orebodies.

GRAND COUNTY.

Gregg Mining & Investment Co.—Denver and Eastern parties are interested in a group of claims on the north fork of the Grand river, and are driving a tnuuel to cut the claims, the chief one being the Wolverine, which produced a good grade of silver one in the early days. It is reported that power drills are to be installed for the speedier development of the group. John Burns, Hot Sulphur Springs, is manager.

The extension of the Moffat road, or what is known as the Denver, Northwestern & Pacific railway, will do much to develop the various mineral resources of this county, and in view of the completion of the new road during the coming summer months, a large amount of development work is under way and indications are ripe for shipments as soon as the iron horse is within reasonable distance. Considerable new machinery will be needed

and installed, judging from present outlook, and the mining industry will be more actively operated during the ensuing year than any previous year in the history of the county.

GILPIN COUNTY.

New National Tunnel Mining & Milling Co.—Operations have been commenced at the Caledonia mine in Lake gulch, the shaft is down 400 and is to be sunk 200 ft. deeper. Concentrating ores are being taken out and daily shipments are to be kept up. The company is also driving a tunnel to cut its large group of claims; is in 2,100 ft. and expects to operate with air drills instead of hand drills. G. W. Adams, Black Hawk, is superintendent.

Boston-Occidental Mining Co.—A Jeanesville pump has been received by the company for its Mascot group in Pine Creek district. C. S. Ripley, Apex, is manager.

Susan Mary.—A strike of high-grade quartz ore has been made in the 50 east level of this property in Lake gulch by Eilmann and Wenzel, as lessees. Assays run as high as 100 oz. gold, with free gold showing in a streak averaging 2 in. wide. A previous shipment went 14 oz. gold and 36 oz. silver per ton, while milling ores gave values of 8 oz. gold per cord. Chicago parties are the owners.

Castleton.—Cleveland (O.) parties are interested in the property situated on Pewaboc mountain, and a 6 by 8 friction hoister and 40-h.p. boiler has recently been installed. The shaft is down 300 ft., and is to be sunk several hundred feet deeper. W. Kirk, Russell Gulch, Col., is manager.

California.—A report to the effect that this property was to be started by the English owners is denied by George Collins, of Denver, who is the resident agent of the California Mining & Milling Co.

Dump.—Local parties are operating this property on Bobtail hill, and are taking out a very fair grade of ores, their last smelting ore going $100 per ton, while their milling ores gave values of between 3 and 6 oz. gold per cord. The shaft is being sunk below the 300 ft. point.

LAKE COUNTY—LEADVILLE.

Work continues unabated on upper and lower Rock hill, and the center still continues to be the great attraction for mining men. By the first of the month work will be started on the Frank shaft, under lease to the English syndicate, and on lower Rock hill, and the first lift will be to the blue lime a distance of 1,000 ft.; if the mineral is not found at this depth the shaft will be sunk deeper. Machinery is being received for the Parson shaft, also on lower Rock hill, and should be in place in two weeks, when sinking will be started.

Weir.—This shaft on upper Rock hill has passed the experimental stage, and is now on the regular list of shipping mines. The body of ore in the main drift has been opened over 100 ft. and the body averages 12 ft. wide. The ore in character and value is the same as in the Reindeer, hard and sand carbonate, netting the lessees $20 per ton. The mine is free from water, so the cost of running it is very small.

Dome.—After being closed for two weeks to do some necessary repair work, this property resumed work at the beginning of the week. The work done previously was in the upper levels where a small streak of ore was opened and followed, but the results were not satisfactory. The present work will be carried on from the 400-ft. level, and driven in a direction to catch the ore shoots on the hill, which trend northeast and southwest. The shaft is only a short distance from the Reindeer, and as the ore in the latter comes up to the end lines of the Dome there is no reason why the ore channel should not be opened in this claim. The property belongs to the Iron Silver Mining Co.

Ben Burb.—Work is being pushed on this shaft, which is 900 ft. north of the Reindeer, and when the work of sinking is completed drifting will commence. In early days a large tonnage was shipped from this claim from the upper workings, and the prospects for catching the same body at a greater depth are very encouraging.

Nil Desperandum.—Water is still keeping back the work of sinking at this property, and after the attempt to keep the shaft dry with a bailer, which failed, the management has decided to put in pumps and extra boilers. When this is accomplished the balance of the 15 ft. will be easily sunk, and drifting south will be started.

Cloud City.—At this mine, near the head of East Fifth street, in the downtown section, the sinking of the shaft to a depth of 600 ft. has been completed, and two drifts are now being run north and south to catch the orebodies in the different directions. To the north the Midas orebody should be found, and to the south the rich ore that was found near the surface in the Penrose will no doubt be opened.

Small Hopes.—From the Emmet shaft of this company a daily tonnage of 25 tons is being shipped to the smelters; the ore is a lead sulphide and also zinc. The old dump of the Forest City, which contains a large amount of oxidized silicious ore, is being shipped to the smelters, the shipments amounting to 100 tons daily.

Ball Mountain.—This section, at the head of California gulch, is receiving attention from mining men, and considerable work is mapped out for this season. The lessees on the Mountain Lion are prospecting for the extension of the Sunday vein, and Howard Platt and associates during the week started sinking on a claim near the Sunday. The latter property is still producing steadily, the ore coming from the third level.

Little Jonny.—But little company work is being done on this property, as the bulk of the ground is under lease, and 200 men are at work. The ground that is being worked the most is at No. 1, 2 and 3 shafts, and the lessees are averaging 150 tons daily of a very good grade of silicious ore. It quite frequently happens that a fortunate leaser opens up a small body of very rich gold ore, proving that this wonderful mine is still far from being played out.

MONTROSE COUNTY.

Gunnison.—The tunnel has been driven through soft adobe shale and gravel a distance of 250 ft. in the last 14 days, from the west (Cedar creek) portal.

SUMMIT COUNTY.

Golden Clover Leaf Mining Co.—This company is organized with a capital stock of $1,000,000. It has acquired the properties on Fletcher mountain, four miles from Robinson; its plan is to put up a mill and smelter and to begin operations in May. There are three well defined veins on the properties averaging 15 ft. wide. Ore taken from the tunnel 100 ft. in shows gold values of $155, nickel 4 per cent., lead 3 per cent. The stock of this company is held in Detroit, Mich., and Toledo, Ohio. George J. Miller is president, Joseph M. Grasser, treasurer, and Charles W. Kirchner, secretary.

TELLER COUNTY—CRIPPLE CREEK.

Empire State Gold Mining Co.—A new plant of machinery is being installed on this property. When this has been done it will enable it to be worked to a considerable depth. The work is being done on company account. The property belongs to the Isabella Mines Co., having been consolidated with the property of the Isabella Gold Mining Co. The latter property is at present being worked under lease to Murphy and Hamlin and associates. A very large amount of ore has been taken from the Empire State property, and it seems reasonable to suppose that the property will again become a heavy shipper. George Kilborn has charge of the work.

El Paso Consolidated Gold Mining Co.—The annual report of this company for the past year shows it to be in a remarkably good condition. The production for the year amounted to 16,539.25 tons of the value of $77.89 per ton was mined on company account, and 3,751,975 tons of ore of the value of $18.02 per ton were taken out by lessees. The total production from the mine amounted to $1,355,935.11, which is over twice as much as the production for the year before. The report devotes a paragraph to the new drainage tunnel, which will cut the El Paso at a depth of 1,400 ft. This company will furnish considerable money for this enterprise. The net profit for the year from mining operations was $768,802, which is something over 50 per cent. of the gross output. A large amount of development work has been done during the year, and a large amount more is planned for the ensuing year. $367,500 were paid in dividends during the year. Cash on hand at the close of the fiscal year amounted to $422,816. On the whole the report shows the property to be in remarkably good condition.

INDIANA.

The sixteenth annual convention of District No. 11, United Mine Workers, was held in Terre Haute this week, and the attendance was the largest in its history. The 1,500 members added during the year brought the membership up to 13,500. Secretary Kennedy reported $87,709 in the reserve fund and that six strikes had been satisfactorily adjusted at a cost of $3,786. The work of the convention was directed toward the revising of the constitution, so as to make it conform to the changes in the national constitution. The Jackson Hill strike was discussed, and defended on the ground that the operators were determined not to confer with the United Mine Workers so long as the Jackson Hill men were out, and also to collect no dues from miners in Sullivan county, in which Jackson Hill is situated, pending settlement of the strike.

At the same time the Indiana Operators' Association was in convention, and served notice on the United Mine Workers that no conference would be permitted unless the men were ordered back at Jackson Hill mines, and that notice had been sent to the operators of Sullivan county to suspend collection for the check weighman and the check-off for dues to the organization. President Kolsem of the operators association says that the miners continually violate the joint state agreement by calling local strikes. The agreement contains provisions to prevent strikes under all circumstances, and provides for arbitration and other remedies in event there is a disagreement over any question.

The operators association also empowered President Kolsem to discontinue work in every mine in any district where the miners at any one mine go on a strike, and also power to discontinue work in every mine in the state if it is deemed necessary to enforce discipline under the joint agreement. The situation is exceedingly delicate, but as the mine workers are generally conservative, it is believed the trouble will be settled by the first of April. At the present state of the market a general shut down would cause no great hardship to the operators. On the other hand, if the miners refuse to withdraw from their position in the Jackson Hill controversy, and a general strike is ordered it will involve much suffering for the women and children all over the Indiana cold field.

IOWA.

At the annual convention of the United Mine Workers of Iowa, held in Des Moines recently, it was voted that the employment of check-weighmen shall be compulsory hereafter at all coal mines employing 50 men or more. Under the old rule, the employment of check-weighmen was optional with the men working at each mine.

LOUISIANA.

CALCASIEU PARISH.

Jennings.—The pipe for the line from Jennings to the Mississippi has been shipped, and all preparations for laying it have been made. While the output has decreased very much the past month, there are still eight gushers in this field. Three wells flowed by air-pressure and 22 pumpers. The total daily production is about 33,000 barrels, and the February shipments were over 500,000 barrels.

NEVADA.

LINCOLN COUNTY.

Las Vegas.—A stage line has been started to Bullfrog, 124 miles distant. Freight teams are here every day loading for that point.

Gold Reed, in Kawich range, 140 miles northwest, is the newest excitement. It is reached easily from Caliente at present, 128 miles away. Water at Kawich is 18c. per gallon, but efforts are being made to get a local supply.

The town site has been surveyed here, but lots are not offered yet, and probably will not be until regular trains can be operated. Many are coming here even though accommodations are very crude. Four hundred to five hundred people are here waiting the offering of town lots for sale. Many prospectors to the north, west, south, and east are getting good assays, but no mines in this immediate vicinity have been opened yet.

OREGON.

BAKER COUNTY.

Mayflower.—A rich body of ore has been struck on the 165-ft. level of this mine in the Cornucopia district. It adjoins the celebrated Union Companion group, owned by John E. Searles, of New York, now in the bankruptcy court.

The Mayflower miners, in making a drift, opened a body of ore which is sylvanite, calaverite and petsite of gold. The owners of the property, who are chiefly Eastern men operating under a Tacoma company, propose heavy development work this season, and will probably put a mill on the property with capacity to take care of the ore tonnage. It is expected, also, that the Vinson railroad will be completed this season, which will furnish cheap transportation for ore and concentrate from all the mines in that section, including the intermediate copper properties in the Medical Springs, Goose Creek, Sparta and Snake River districts.

United Elkhorn.—The new electric pumping machinery will arrive in a few days, and when that is installed deep-sinking operations in the main shaft will be resumed. Forty men are at work in the various tunnels and drifts, and between 5 and 10 tons of ore are being shipped every day to the Sumpter smelter. The ore has to be hauled 16 miles by wagon to Baker City and is re-shipped 30 miles by rail. Edward I. Fields is manager.

I. X. L.—At this mine in the Greenhorn camp much satisfaction is expressed at the prospects for this season. Fred T. Kelly, the manager, has gone to Chicago and New York for the purpose of purchasing large pumps and increased hoisting machinery. A splendid grade of ore has been opened in the property, and deep sinking will be the rule in the I. X. L. as well as in the adjoining mines in the same camp.

TEXAS.

HARDIN COUNTY.

Saratoga.—The production here has fallen off, the gushers not retaining their large initial output for many days. The daily production is about 11,000 barrels.

The five wells of the International Oil Co. are all being pumped. No. 5 yields 600 barrels, and the others an average of 250 each. Moonshine Oil Co.'s No. 2 has been deepened, and is doing 1,000 barrels. Guffey Greer, No. 2, was deepened, and is again flowing. Producers No. 1 and 3 are also being drilled deeper.

HARRIS COUNTY.

Humble.—The Texas Co. is laying a 6 in. line from the field to Houston, a distance of 17 miles, and expects to complete it this month. Ten acres have been purchased in the city for a loading station, and connections will probably be made to allow direct loading at deep water for the export trade. This is now the largest Southern field. There are 30 producing wells, 55 being drilled and the daily production is about 60,000 barrels. Salt water is already reported in some and the new wells will likely only make up for the decreasing output of the early gushers. Practically all the oil is in Eastern storage, the completed capacity of which is 2,800,000 barrels, with 1,500,000 under construction. There are only two steel tanks holding 75,000 barrels.

JEFFERSON COUNTY.

Beaumont.—The Sun Oil Co. has leased the United Oil & Refining Co. pipe line between Beaumont and Sour Lake. Oil operators and business men generally have forwarded a vigorous protest against the Kennedy bill, which proposes to levy a tax of 2 per cent. upon the gross earnings of persons and companies engaged in producing, transporting, refining or selling oil. The bill would have the effect of imposing the tax several times on the same oil while it was going from the producer to the consumer. This freak and bungling bill and the tangle of pipe line legislation has checked development. The pipe line question has, however, been amically discussed by producers and pipe line owners and a bill drawn up for submission to the legislature which seems to satisfy all interested parties.

South Texas fields are estimated to be daily producing 100,000 and Jennings 33,000 barrels daily. Market for crude very quiet at following prices: Humble, 15@16c.; Batson, 23c.; Sour Lake, 25c.; Saratoga, 23c.; Spindletop, 30c.; Jennings, 18c.

UTAH.

Ore and Bullion.—Settlements for last week aggregated $450,000, according to a statement furnished by Salt Lake banks. The copper bullion shipments from the smelters aggregated about 1,000,000 lbs.

BEAVER COUNTY.

Copper Ranch.—This property is in new hands, and development work will be carried on henceforth along more systematic lines than heretofore.

Frisco Contact.—The new hoisting plant at this property is in place, and the sinking of the main working shaft will begin within a few days. The management expects to be in the market with some high grade ore by July 1.

WEST VIRGINIA.

FAYETTE COUNTY.

Berwind-White Coal Co.—This company has purchased five mines and 3,000 acres of coal land belonging to W. P. Rend, of Chicago, in the New River district, on the Chesapeake & Ohio railroad. It has also bought 1,800 acres of coal land adjoining these properties from Colonel J. L. Beury, the sales aggregating $2,000,000. The purchase carries with it a fuel contract with the Chesapeake & Ohio railroad.

Foreign Mining News.

CANADA.

BRITISH COLUMBIA—BOUNDARY DISTRICT.

Boundary Ore Shipments.—Shipments for the week ending March 11 were as follows, in tons: Granby, 12,340; Mother Lode, 3,040; Brooklyn, 1,942; Rawhide, 1,681; Mountain Rose, 240; Brooklyn, 130; Montreal & Boston, 210; Orodenoro, 30; Elkhorn, 20; Skylark, 60. Total for week, 19,683 tons.

NEW CALEDONIA.

The exports of ores from the Colony for the full year are reported by the *Bulletin du Commerce*, of Noumea, as follows, in metric tons:

	1903.	1904.	Changes.
Nickel ore	77,360	98,655	I. 21,295
Cobalt ore	8,292	8,964	I. 672
Chrome ore	21,437	42,197	I. 20,760

The exports of cobalt ore and chrome ore were much larger than in any previous year. The largest exports of nickel ore reported were in 1901, when the total was 133,676 tons, or 35,021 tons more than last year.

NEW ZEALAND.

Exports of gold from the Colony for December and the full year are reported by the Mines Department as follows, in ounces of bullion:

	1903.	1904.	Changes.
December	49,794	29,131	D. 20,663
Year	533,314	520,320	D. 12,994

The bullion reported for the year 1904 was equal to 467,260 oz. fine gold, or $9,659,260 in value.

Exports of silver for the same periods were as follows, in ounces:

	1903.	1904.	Changes.
December	59,263	56,693	D. 2,570
Year	911,914	935,741	I. 23,827

THE ENGINEERING AND MINING JOURNAL
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Altitude as a Factor in Engine and Boiler Design.

By Lindsay Duncan.

The injurious effect of a rarefied atmosphere upon the efficiency of air compressors is well known, but it is not believed that it receives the consideration that it should in the design of engines and boilers for high altitudes.

Let us take the formula for the mean-effective-pressure of a simple engine, as given by Kinnealy in his 'Steam Engines and Boilers,' namely:

$$P_e = P_1 \frac{(1 + \text{hyp. log. } r)}{r} - P_b$$

where P_1 = Initial steam-pressure (absolute).

P_b = Mean-back-pressure (absolute).

r = Ratio of expansion of steam in the cylinder, clearance being taken into account.

Now r is a constant for any given valve-setting, and will always be greater than unity. It can thus be readily seen that the fraction $\frac{(1 + \text{hyp. log. } r)}{r}$ will be a constant for any given value of r, and that as r increases the value of the fraction will steadily diminish, being at all times *less* than unity. Let this fraction equal k, where $1 > k > 0$. We may then write the expression for the mean-effective-pressure:

$$P_e = P_1 k - P_b$$

Now let P represent the boiler pressure (gauge), which is independent of the altitude, and let p and p′ represent the atmospheric pressures at sea-level and at some higher altitude, respectively; also let b represent the excess of the mean-back-pressure over that of the atmosphere due to friction in the exhaust ports, etc.

Then at sea-level, $P_e = (P+p)k - (p+b)$ while at some greater altitude $P'_e = (P+p')k - (p'+b)$. Subtracting P_e from P'_e and rearranging terms we have:

$$P'_e - P_e = k(p' - p) - (p' - p)$$
$$= (1 - k)(p - p').$$

Now p is greater than p′, and k is less than unity; that is to say, both factors of the right hand member of the equation are positive, and hence their product is positive. It follows then that the left hand member of the equation is always greater than zero.

In other words, the mean-effective-pressure is increased by a reduction of the atmospheric pressure caused by an increase in altitude; and the amount of the increase is independent of the boiler (gauge) pressure.

Under ordinary conditions, the increase will amount to one or two pounds in comparing conditions at Denver with those at the sea-level. For example, let the cut-off take place at one-fifth of the stroke; and let the clearance be 0.08 of the volume swept by the piston.

Then $r = \frac{5(1 + 0.08)}{1 + 0.08 \times 5} = 3.86$ and $k = \frac{1 + \text{hyp. log. } 3.86}{3.86} = \frac{2.351}{3.86} = 0.61$.

$P'_e - P_e = (1 - 0.61)(14.7 - 12.0) = 0.39 \times 2.7 = 1.053$ lbs.

Let us regard the effect of altitude upon boiler efficiency. By starting with the assumptions that the number of thermal units due to the complete combustion of a pound of carbon will be unchanged by the altitude, and that the temperature of the feed-water is the same in all cases considered, we shall get the total thermal units required to raise water from 32° F. to steam at 150-lbs. pressure (gauge), at sea-level, as compared with those required to produce a like effect at Denver. The results, which are tabulated, are based on data given in Peabody's "Steam Tables."

Place.	Atmospheric pressure.	Boiler pressure (gauge).	Absolute steam pressure.	Temperature, Fahrenheit.	Total B. T. U. required.
Sea-level	14.7 lb.	150 lb.	164.7 lb.	365.7°	1193.4
Denver	12.0 lb.	150 lb.	162.0 lb.	364.4°	1193.0

It will thus be seen that the difference in thermal units required (while slight) is in favor of the higher altitude. The most marked effect, however, relates to the size of openings (in the furnace) required for the admission of air and the escape of flue-gas. As the space occupied by any given quantity of a gas is inversely proportional to the external pressure exerted upon it, a given weight of air at sea-level will occupy 14.7/12.0 of its former volume, if carried to the altitude of Denver. The effect of this is that, in order to maintain the same velocity of the air and flue-gases, we must increase our air space and chimney section 22½% over those required at sea-level.

It is believed that this fact is not generally taken into consideration; it is probably responsible for many of the inefficient and smoky furnaces which exist in regions of any considerable altitude.

It is calculated that the mass of the solar corona is not necessarily greater than 25,000,000 tons.

Incandescent gases under slight pressure give light composed of lines; but under pressure, a continuous spectrum.

Phlogiston was an old name for the action and quality now known as chemical reduction. The principle was named by theory, but it was evolved by practice.

The Indiana Oil Industry.

Special Correspondence.

The condition of the oil industry in Indiana has become an index to affairs that figure largely in the financial and commercial progress of the State. A report for the year 1904 probably reflects the buoyant situation and the bright outlook more truthfully than the report for any previous year. However, the oil industry is pleading more than ever for an independent market and less domination upon the part of the Standard Oil Corporation. Independent refineries have been suggested, but no relief has been secured along these lines as yet.

During the year a large area of producing territory was added to the Indiana oilfield. This addition was not made to any notable strike, but by gradual development along the margins of tested productive territory; the field, which covered 1,350 square miles January 1, 1904, has been increased at least one-third. About 300 new oil companies were formed and incorporated during the year, and 55 foreign companies were admitted to do business in the State under the corporation law. There were 4,049 producing wells drilled during the year, and 577 dry holes.

The production of the Indiana wells in 1904 proved the largest year's output in the history of the oil industry in the State. Less than 700,000 bbl. were produced in January and February, but from that on the production increased rapidly, owing to the many gushers found in the deep-sand pools. The increase was from 683,334 bbl. in January, to 1,065,620 bbl. in December; total production for the year, 10,744,849 bbl.; valuation, $11,305,688. The average price paid was $1.08¼. Land owners received about six million dollars for their royalties, and the rest was received by the well owners. There were at the close of the year 30,540 producing wells in Indiana, a limited number of which produce gas. This record is unequaled by any other high-grade oilfield in the United States. Fabulous prices are being paid for territory, and companies' holdings change hands occasionally at figures that are surprisingly large. Some companies pay as much as 50% monthly dividends, others 300% yearly. The oil industry is destined to bring more wealth to Indiana than did natural gas during the seventeen years of its production.

The Edison nickel storage-battery has the advantage over the lead cell, of great stability in withstanding shock, short charging-time, and the absence of acid fume. But it has the disadvantage, that the voltage does not indicate the end limit of the charge; moreover, in practice, the current cannot be drawn to the limit. This means that for a given voltage, one and one-half as many Edison cells as lead cells must be used for the same effect.

The Mesabi Iron Ore Range.—IX.

By Dwight E. Woodbridge.

That slender neck of water that connects lakes Superior and Huron contains the greatest throat for commerce in this world. Through its tortuous course—so narrow that, by a touch upon a jagged rock or a sheer against a sister vessel, one ship may effectually bar the traffic of the West for days or weeks—along that restricted, locked, meandering channel, three times as great a traffic is carried every eight months as the Suez bears in twelve. One connects a few new northwestern States with their contiguous commonwealths, the other is the ungated highway over which pass the storied riches of the East; it is the beaten track for nations that were old before the dawn of history. And yet, this year, 1905, marks the fiftieth anniversary of the opening of the fresh-water channel and the beginnings of Lake Superior as a commercial factor. To-day there is no habitable spot upon the globe so far from civilization, so difficult of access, as was the head of Lake Superior fifty years ago. Before the opening of the St. Mary's Falls canal, in 1855, the rapids it overcomes formed an insurmountable barrier to commerce.

UNLOADER AND INCLINE CANTILEVER EXTENSION.

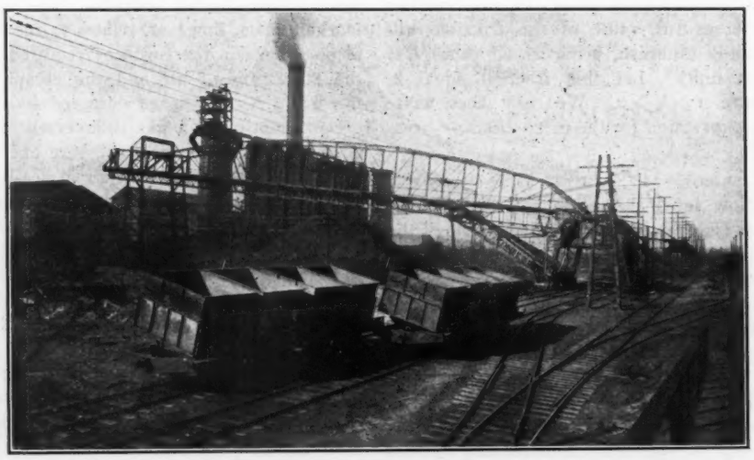
In 1845 and 1846 the Jackson and Cleveland mine locations, at what are now Negaunee and Ishpeming, were staked. They lay 14 miles from the shores of the great lake, but the interminable forest of virgin pine covered the land, and nothing but moccasined feet marked the path.

To-day the ore-laden ship passes out between the pier-heads at Duluth, thronging with great vessels, types of the latest thought and most advanced practice in ship construction. A few miles down the lake another stream of boats joins the squadron coming from Two Harbors. Still further on come the ships that have laden at Gogebic docks, and, wheeling into line, the procession sweeps in majestic curve around Keeweenaw point, on its way to the East. Just beyond that rocky scimetar, the craft from Marquette unite with the main current, and the throng, mighty in its impressiveness, moves down upon the Sault. Passing this, and debouching upon Lake Huron, vessels coming up Lake Michigan from its ore and package shipping ports force their place in the ever growing line. Finally the vast and continuous procession, with ships always in sight and close together, closes in once more for the passage of the straits, and before Detroit there moves constantly, day and night, never ending, never changing, squadron upon squadron, like stately frigates of the line, the most impressive commercial panorama the world can show. Forty million tons of commerce pass up and down the narrow river every season of navigation.

The lake transportation of ore is a specialized sort of operation, and it is the combination of facilities in docks, ships, ore-handling devices and railroads that has made the lake commerce famous throughout the engineering world. With a relatively short haul and a brief season of navigation, dispatch in loading and discharging cargo is the essential factor in the determination of the freight charge. It is not the ship that makes most rapid speed upon the open lake that makes the money, but the vessel whose rate of journey is based upon an economical use of fuel, and that receives quick handling at terminals. For that reason, the efforts of both vessel-owners and of engineers designing cargo-handling apparatus have been toward speed and ease of moving freights. From that effort the ore-dock has grown in height, length, capacity of pockets and speed of operation; the ship has anticipated every move of the designer of rapid unloading devices; the receiving dock is full of marvelously designed automatic equipment, intended to save time or a few cents a ton in the cost of lifting out the cargo of ore.

The requirements of the ore-carrying trade have developed a special type of steamer, of large capacity, designed only for cargo. In the newest type practically the entire deck is chopped up into hatchways. They are of width to accommodate the various unloading machines used, and their spacing and size insure that the entire cargo is directly tributary to them, and that practically all the load shall be taken out by the automatic device.

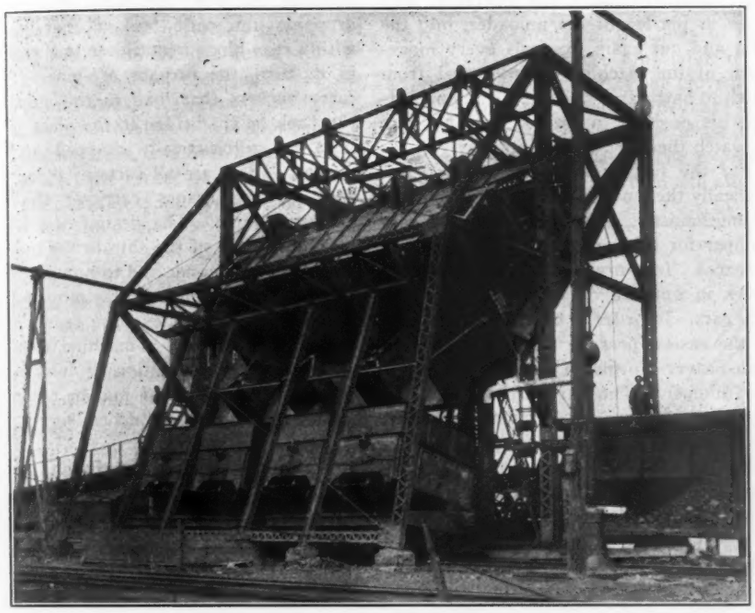
The unit of construction spacing for an ore ship is the length of the ore car in vogue on Lake Superior. This car is 24 ft. long. The dock pockets are, therefore, 12 ft. wide, center to center. Therefore, the ship has had her hatch openings 24-ft. centers, and they have occupied all the width of the deck except for a five- or six-foot space along each rail. With these openings she could load from every other pocket, and when a series of pockets were empty, a 12-ft. shift along the dock would put the hatchways in front of another series. But within the last four or five years the problem of rapid unloading, and the elimination of the swarthy ore-shoveler, wedded as he was to holidays, to strikes and to riots, was attacked by skilful engineers. A new type of ship's



ORE-STOCKING BRIDGE AT YOUNGSTOWN.
The bridge cars transfer the ore from the railroad cars to the stock-pile.

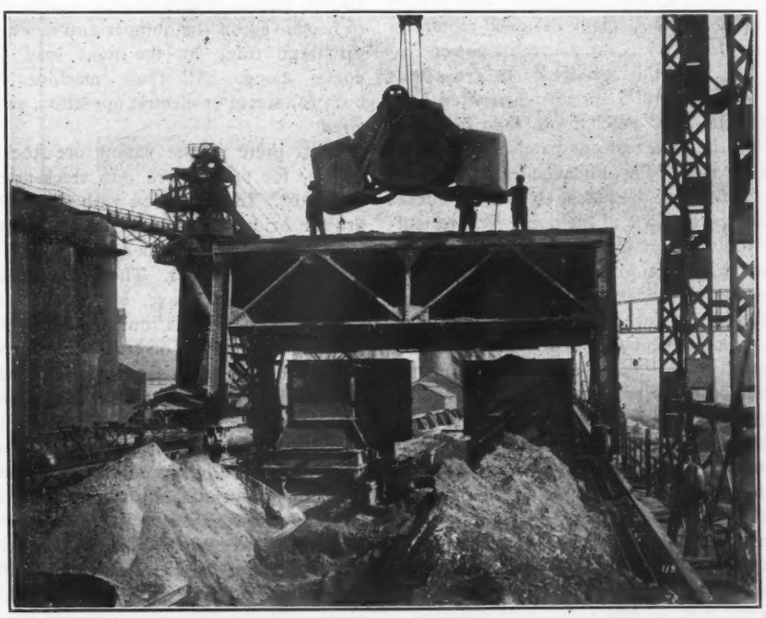
deck was demanded, one with openings enough to permit an unloading machine to operate all over the interior of the vessel.

So about three years ago A. B. Wolvin, of Duluth, at that time probably the boldest experimenter who built a ship, constructed the *Jas. H. Hoyt*, with nineteen cargo hatches, all spaced 12-ft. centers. Her first cargo, taken on in August, 1902, demonstrated the success of the idea. Not only was the cargo loaded at the head of the lake in record-breaking speed, but it was delivered at Conneaut docks in such time as made everybody sit up and take notice. Ninety-six per cent of her load was removed without the assistance of shovelers, and at the rate of 1,000 tons an hour. The first Hulett unloader had been installed at Conneaut in 1900, and had made some remarkable records, both of efficiency and cheapness. It was the outgrowth of the idea that, if vessels could be loaded at upper lake points in three or four hours, they might perhaps be emptied in less than ten or twelve, and there might be less human labor about it. The work was tremendously severe, the hours were long, the men were 'tough.' They were not to be depended upon, while steam, properly applied, was sure not to strike, nor demand a holiday when the pressure on docks was greatest and the ships were arriving in squadrons.



CAR-DUMPER AT BLAST FURNACE

The older forms of automatic buckets were essentially digging buckets, and were for coal, whose nature is sufficiently mobile or penetrable to permit a weighty clam-shell or scoop to enter and fill itself. But iron ore is neither mobile nor penetrable; it is heavy, and often contains lumps of hard ore so locked that no ordinary bucket will make way in it. For this reason it was not considered possible to build an automatic bucket that would work in ore; and it was not until Geo. H. Hulett, in 1899, induced the Carnegie Steel Company to take up his new plan for a great unloading machine that the automatic idea received much attention. Mr. Hulett's first device required some modification, as was found upon trial in that year, but it was the parent of the great machines now in successful operation.



TWO-PART BUCKET AND GANTRY.
The bucket dumps its load into the bin, from which it is discharged into furnace cars.

About twenty-five years ago the first "Brown hoists" were erected by A. E. Brown, of Cleveland, and since then they have been brought to a high state of efficiency. They served the combined purpose of direct transfer of ore from vessels to cars, of transfer from vessels to storage, and of reloading from storage to cars. While the development of high hoist and trolley speeds produced really remarkable results in reducing the time taken per trip, the fact that the tubs were filled by hand shoveling, and that the loads were relatively small, say from 1 to 1.5 tons, militated against large capacity. Still, by increasing the number of hoists at a ship it became possible to unload a 7,000-ton cargo in twelve hours. But, as said above, both costs and time were to be cut, and the leading devices for this purpose have been that of the Hulett unloader, built by the Wellman-Seaver-Morgan Company, and the Mason, built by the firm of Hoover & Mason.

The former has been developed largely at the docks of the South Chicago plants of the United States Steel Corporation, the latter at points along Lake Erie. The Mason device, at South Chicago, is one of the most complete ever installed for handling ore from ship to cars, storage or furnace. Fifteen hoisting towers, mounted on gantry legs, face the dock front and deliver ore from the ship, either into cars or to an enormous concrete trough that parallels the path of the unloaders. Behind this trough is the ore storage, spanned by independently movable steel bridges 518 ft. long. One end of these bridges overhangs the trough, and the other covers the ore pockets. Each is equipped with a 10-ton ore-bucket, operated electrically, and carried on a trolley carriage from which the bucket depends. This bridge bucket takes ore from the trough, where it has been deposited by five-ton automatic buckets depending from the towers, and delivers it to storage or into a transfer

car running on top of the furnace-charging bins, and designed to distribute into them. Trolley speeds of 1,000 ft. a minute are reached with a load, including bucket and ore, of 100,000 pounds.

In the Hulett device, as built by the Wellman-Seaver-Morgan Company, each machine has two parallel girders at right angles to face of dock, mounted on moving trucks. On these girders the trolley, or carriage, carrying a walking-beam, travels back and forth, over the hatch of the vessel and back again. This beam has suspended at its outside end a vertical leg, provided at the lower end with an automatic scraping bucket. The operator, riding inside the leg, controls the bucket and the entire movement of the walking beam. The latter oscillates up and down, carrying the bucket down into the vessel's hold and up again, with its great load of 10 tons of ore, scraped up under the eye of the operator. As the leg is lifted up out of the ship and back over the dock, it can either discharge underneath, into railroad cars on tracks running between the legs of the machine, or it can dump into a bucket-car, which travels out upon the same framework as that of the walking-beam itself. This latter is in case the ore is to be carried back to other tracks, or to stock-pile in the rear of the entire structure. The leg is mounted on rotating trunnions in the walking-beam, so that it can turn a circle when operating in the hold of the vessel, thus allowing the bucket to reach out in all directions beneath the hatch. The bucket is opened and closed by hydraulic power when steam is used, or by specially designed motors in case electricity is the source of power.

The bucket is usually of 10 gross tons capacity, its total spread when wide open enabling it to reach more than half way from the center of one hatch to the center of the next. The unloader leg also travels lengthwise of the hatch, so that the bucket reaches the sides of the boat. Consequently the operator is enabled to reach almost the entire cargo. In an ordinary American ore-carrying boat, there is no difficulty in reaching 90 per cent of the cargo, and in some of the modern boats machines have actually unloaded 97 per cent without the help of shovelers. With slight modification they can be adapted for use, in connection with the ordinary tramp ocean steamer, to even better advantage than with the American boats.

When operating a number of machines on the same dock, it is customary to have several railroad tracks under the girders so that no delay may occur in supplying empty cars, in which case each machine is provided with a bucket-car. The legs that support the girders are usually wide enough apart to permit of four tracks. When it is desired to put ore into storage, cantilever extensions inclined upward are attached to the rear of the girders, and these carry a track for the bucket-car, so that ore can be conveyed by it out on the cantilevers and dumped where desired in stock-pile. The bucket-car is automatic in its operation, dumping itself at any point desired and returning closed to its position under the hoppers, ready to receive another load. The operator, who rides in the leg of the unloader, into the ship and out again, controls every movement of the machine except travel from hatch to hatch and operation of the bucket-car, his position in the leg enabling him to watch the work to advantage.

For the further handling of ore automatically there are many other refinements of mechanism. There is the Hulett car-dumper for iron ore, as employed at blast furnaces. Iron ore usually arrives at furnaces in gondola or hopper-bottom railway cars. In order to handle this material in the easiest possible manner, the Wellman-Seaver-Morgan Company has built the dumper. The cars are run on the dumper by means of a patent mule car, that runs on a narrow-gauge track between the standard-gauge rails, and disappears into a pit at the foot of the incline approach, thus permitting the loaded cars to pass over and in front of it. After the loaded car is in position, it is clamped by a mechanism that operates simultaneously with the inverting mechanism of the dumper. The cars are then inverted sufficiently to send out the contents. The ore slides into bridge-cars. These latter are designed to run up the conveyor bridges over bins or stock-piles, where the ore is to be dumped. When the railway car in the dumper is rotated back to its position, the clamps release it and the car stands free, to be shoved off the dumper and down the discharge track by the next load that comes along. All these machines are built for steam or electric operation, as desired.

Then there is the patent ore-stocking bridge, for putting ore into stock-pile at least cost. In connection with this bridge are the bridge-cars referred to in connection with the car-dumper, and which are loaded by the dumper. The ore arrives, as has been stated above, on the ordinary railroad car, and is dumped into four bridge-cars mounted on tracks built across a transfer car. This transfer car runs on standard-gauge, and the bridge-cars are set at right angles to the main line. The transfer car is pushed out from under the dumper by an engine and spotted in front of one of the incline bridge approaches. It is not necessary that the locomotive place the transfer car in exact position, as the incline tracks can be shifted by an operator who locks them when in place. The bridge-cars are hauled up the incline and out on the bridge by cable, and are automatically dumped where desired on the stock-pile, when they are returned and set on the transfer car ready for another load under the car-dumper.

In addition to all these mechanical contrivances and elaborate pieces of construction, there are many others, almost as many as the number of works that have been recently equipped for rapid handling of ore. There are great conveyor bridges covering a stock-pile span of 300 to 500 ft., with fronts of hinged cantilevers, reaching out over the ship's hatches for dropping automatic buckets therein, and with a rear hinged cantilever that reaches, in its turn, the furnace ore-bins. These carry buckets that load in the ship, and run back on the bridge to the place where they are automatically dumped and returned. There are all sorts of flying tubs and whirling cranes carrying the tubs back and forth. The design of all is to get the ore out of the ship in the quickest and cheapest manner and to move it to the charging bins with as little human labor as possible; and no expense seems to be too much to secure a machine that will eliminate the intervention of muscle and avert the possibility of human error and a consequent misplaced dependence.

Iodobromite in Arizona.

Professor W. P. Blake, in the *American Journal of Science,* says that the rare compound of silver, iodine, bromine and chlorine, iodobromite, occurs in thin seams and crusts in a vein of quartz and calcite near Globe, Pinal county, Arizona. The crystallization is obscure. It is soft, like talc; luster, vitreous; color, light lemon-yellow to sulphur- and canary-yellow. Not being able to secure enough for a satisfactory quantitative analysis, the results of the determinative tests are added. The reactions before the blowpipe are remarkably beautiful and interesting. Heated in a closed tube with bisulphate of potash, the mineral quickly changes color to a dark salmon, or orange-red, heavy brownish-red fumes of bromine are given off, and bromine condenses in the higher portion of the tube; violet vapor of iodine then appears, and crystals of iodine form below the condensed bromine. The fused assay, floating in the flux, is brilliant cherry red, at first very dark red, but on cooling gradually loses this color, passing through various shades of red until the normal yellow color is restored. The fused mass then being removed from the tube and reheated until the bromine and iodine are expelled, and treated with carbonate of soda on charcoal, a button of metallic silver is obtained. The fused carbonate of soda dissolved from the coal gives the reaction for chlorine with silver nitrate. In the final reduction of the assay to the metal a slight yellow areola, like that from lead, was observed and referred to probable slight impurity.

The electric furnace was the subject of a recent lecture by Adolph Minet, in which the following periods were outlined, namely: (1) The furnace in the laboratory, 1808 to 1886; (2) the furnace in industry, 1886 to 1890; (3) the products of the furnace in industrial application, 1890 to the present.

Explosive Rock.*

By J. B. Jaquet.

A severe explosion of rock occurred in the New Hillgrove Proprietary mine, New South Wales, on the morning of December 15, 1904, at the No. 6 level and in the stopes between this and No. 7 level. The shock affected the country for a mile or two around, as if an earthquake had occurred, and awoke residents of Hillgrove, who live upon the table-land more than a mile distant from, and over 2,000 ft. vertically above, the center of the disturbance. The main incline shaft was displaced between the No. 6 and 7 levels, and the No. 6 level north was destroyed. Stull pieces were broken, and rock was shifted in the adjoining Baker's Creek mine. The total area affected was over 300 ft. long and 100 ft. high.

These sudden outbursts have long been a source of anxiety to the miners of Hillgrove, and there is evidence to show that they are increasing in violence as greater depths are being reached. I believe I am correct in saying that no previous 'explosion' affected such a wide area and caused such disastrous results as the one which occurred recently.

Explosive rocks are not peculiar to Hillgrove, but have been described as occurring in many parts of the world. Outbursts which are similar in character have caused trouble in the working of the gold mines of Mysore, in India, and a long account of the phenomena will be found in the report of the chief inspector of mines, W. F. Smeeth.[1] The bursts in Mysore are not confined to one particular rock, as would seem to be the case at Hillgrove. Quartz reefs, hornblende schists and trap-dikes have at different times been known to 'fly.' In the lead mines of Derbyshire, England, slickensided rocks are encountered which are liable to burst on being struck with a hammer or even scratched with a pick.[2]

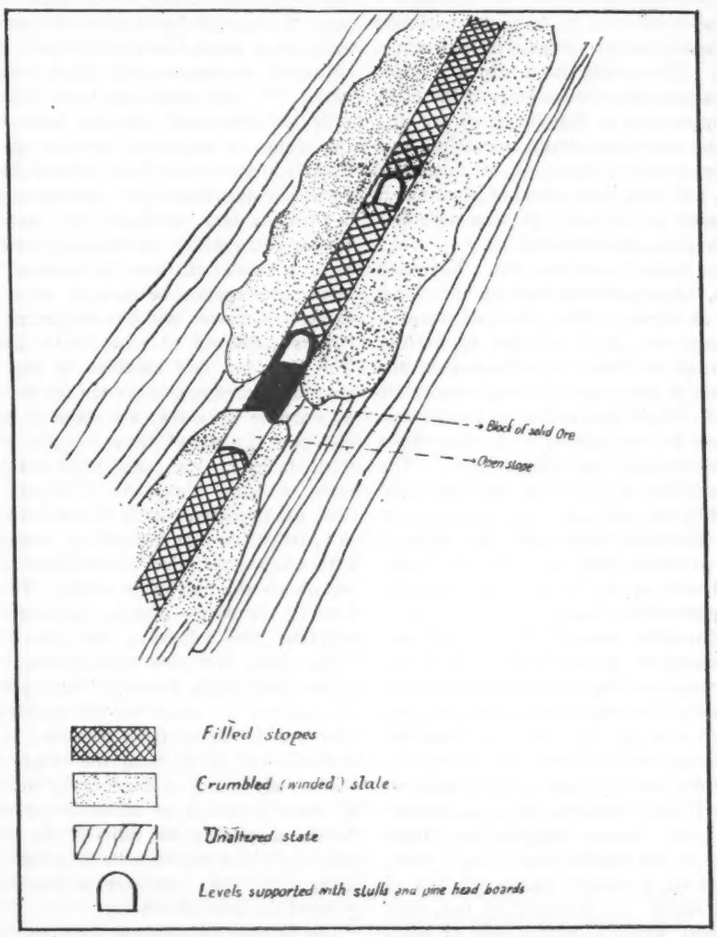
J. E. Carne, assistant government geologist (New South Wales), has mentioned that the seams of kerosene shale in the Genowlan and New Hartley mines in this State spit and fly when being worked, so that the miners are obliged to wear wire-gauze guards as a protection to their eyes.[3]

E. C. Andrews, geological surveyor, has given a brief account of the Hillgrove 'kicking' rocks in his report upon this district, and the geological map and sections which accompany it will assist those who investigate the phenomena.[4]

J. R. Godfrey, inspector of mines (New South Wales), a few years ago made some investigations with the object of ascertaining the cause of the bursts. His inquiries, however, were interrupted before he arrived at any definite conclusions in regard to the matter.

The outbursts, according to my informants, have never been known to occur in shafts or cross-cuts off the lines of reef, though these workings are liable to be affected by the shock or by the movements which accompany them. They are also confined to a certain zone or block ('the kicking-ground') of slate. The explosive rock is a more or less silicified and altered, dark-colored slate, traversed by numerous joints which intersect at all angles. The joints are often coated by thin films of calcite. When tapped with a hammer, particularly after exposure to air, the rock will break or crumble into numerous fragments which may exhibit a sub-conchoidal fracture. In this connection it is interesting to know that Mr. Smeeth describes the explosive dikes on the Kolar goldfield as possessing a well-marked system of joints, while the blocks formed by these planes exhibit spheroidal weathering in a marked degree.

The Hillgrove rock is liable to 'kick' and 'spit' at any time when mining operations are in progress, particularly after blasting, but the more serious outbursts, and those which cause us the most concern, have occurred when a 'bridge' of ground is being removed below a level. Sometimes fragments of rock fly from the walls with a velocity almost approaching that of a projectile from a gun. In an unpublished report dated April 8, 1899, Mr. Godfrey states, concerning explosive bursts in the Baker's Creek mine, as follows: "On one occasion two men were drilling in the face of the stope just above No. 11 level when a piece of the ground flew out and cut one of the eyes out of one man. On another occasion the whole of the floor of No. 9 level over one section of stopes split up into thousands of fragments with a noise like breaking crockery, filling up the drive and nearly burying one of the underground bosses, while on the third occasion a large piece flew from the face of one of the stopes in No. 11 level and cut a man in halves."



It has been suggested that the bursts are due to the following causes: (1) Molecular strain; (2) occluded gases; (3) to a compression of the slates upon their being intruded by a mass of granite or through other causes.

1. *Molecular Strain.*—This theory was based upon a statement that a piece of the rock had, when struck, exploded with some violence. It was suggested that the

* From advance copy of Report by the Chief Inspector of Mines, New South Wales.

[1] Mysore Geological Department, 'Report of Chief Inspector of Mines,' 1903, pp. 45-66.

[2] Aubrey Strachan, *Geological Magazine*, 1887, pp. 400-408.

[3] 'Kerosene Shale Deposits of New South Wales,' Geological Report, No. 3, p. 84.

[4] 'Report on Hillgrove Goldfields,' Mineral Resources,' No. 8, 1900, p. 18.

slate was in a state of molecular strain, and could be compared to the so-called Prince Rupert's drops, which are made by suddenly cooling drops of molten glass. The drops, when struck or allowed to fall, break with a certain amount of explosive violence into a number of small fragments. The Hillgrove rock, particularly after exposure to the air, readily disintegrates and parts along its many joint planes upon being tapped with a hammer, but its component parts do not violently separate from one another. This theory has been put forward in explanation of similar occurrences elsewhere. Mr. A. Strachan, in the paper referred to upon the explosive slickensides in the Derbyshire lead mines, says: "The explanation which perhaps best satisfies the requirements of the problem appears to be that the spars are in a state of molecular strain, resembling that of the Rupert's drops or of toughened glass, and that this condition of strain is the result of the earth movements which produced the slickensides."

Mr. Smeeth quotes Mr. Bosworth Smith, the superintendent of the Tank mine, as saying: "The cause of the phenomenon was similar to that of the explosion of a Prince Rupert's drop or the bursting or cracking of a toughened glass globe." While stating that this hypothesis accounts for the spitting of the trap dikes and hornblende schists, he says: "The air blasts that occur in the quartz may be caused by the pressure of the walls of the lode. The lodes show many evidences of great pressure, and this has in places caused movements in the walls and the consequent slickensides."

2. *Occluded Gases.*—No gas of any kind whatsoever has, so far as I can learn, been found escaping from the rock, nor has carbonic acid or other extraneous gas been detected after an explosion has occurred.

3. *Compression of the Slate as the Result of the Intrusion into it of an Igneous Rock.*—If the outbursts were due to this cause alone, then we might expect them to occur in the neighboring Sunlight mine, and, indeed, anywhere within the belt of altered slates. As a matter of fact, they occur only within a certain zone or block a few hundred feet long.

The explanation which I have to offer is that the bursts are due, firstly, to the walls being in a condition of strain, and, secondly, to the fact that the kicking ground will not bend; it only breaks, and, while breaking, disintegrates into a number of fragments. An ordinary slate under similar conditions of strain would probably slowly yield to the pressure and slightly swell into the level or stope. The 'kicking' slate offers a resistance to the pressure as long as possible, and eventually succumbs with a burst. Its powerful resistance is weakened by contact with air ('winding') and by the shock of blasting or by hammering. Any one entering an open stope within the 'kicking' zone will notice that the slate walls are 'winded' and crumbled, and this alteration would seem to be not merely superficial, but to extend for some distance inward from either wall, so that upon either side of the filled stopes we have a layer of loose rock which readily yields to pressure from above.

By means of the accompanying diagram I will attempt to explain how it is that the serious bursts occur when the stopes are approaching a floor or level from below (during the removal of the 'bridge'). As the remaining portion of solid roof is removed and the air gains access to the walls, the portion of unaltered and coherent slate becomes smaller and smaller until the crumbled rock above is supported only by a small block of ground, which ultimately succumbs and bursts into the stope. It will readily be seen that not only the stope but also the level above the bridge, or any other workings such as a shaft in the vicinity, are liable to be disturbed or destroyed by the moving country.

Precautionary methods are necessary when mining within the 'kicking' zone. It will, I think, at once be realized that operations cannot be carried on in the explosive ground without subjecting the miners employed to some extra danger. The blasts are not heralded by any premonitory symptoms, hence the miners have no warning when they are about to occur. However, the loss of life and bodily injury attributable to this cause have not been great, and on the whole I should not class the two mines liable to the outbursts as particularly dangerous as compared with many other mines in the State which are unsafe through other causes. The effects of the bursts may be minimized by adopting the following methods: (1) Using large, soft pine head-boards, three inches thick, with hardwood stull pieces; (2) sinking all shafts in the country at least 100 ft. away from the reef to be worked; (3) by keeping the stopes low and closely filled, and generally keeping all open workings as small as possible; (4) by supporting the walls of the stopes with stulls and head-boards in addition to filling when they approach within 20 or 30 ft. of the level above.

The Mining Department for some time past has insisted that a large soft pine head-board, three inches thick, should be used with every stull placed within the 'kicking' zone. The advantages which accrue from the use of these head-boards are apparent to any observer. Not only has the risk of accident been minimized by their use, but by obviating the necessity to 'double-bank' broken stulls, the cost of working has been lessened. The soft head-boards take up the pressure gradually and prevent it coming too suddenly upon the unyielding hardwood stulls. In many places one can observe head-boards originally three inches thick crushed down to under an inch, yet the stull remains sound and unbroken, while other pieces in the vicinity without head-boards have been broken and rendered useless.

Ore Deposits in Relation to Thermal Activity.*

By James Park.

Hot Springs.—At Waihi, Kuaotunu and Great Barrier Island (New Zealand), there are huge veins of quartz, mostly chalcedonic, many of which are still capped with wide mushroom-shaped 'quartz-blows.' In many cases the mushrooms of quartz have been partly or entirely removed by denudation. The truncated veins at Waihi are of hot-spring origin, for this has been confirmed by the discovery of organic remains in a vein several hundred feet beneath the surface.

In March, 1898, in a large cavity in the Silverton lode at No. 3 level, there were found three pieces of tree-fern entirely replaced by iron pyrite. The occurrence has an extraordinary interest in connection with the formation of mineral veins, and fortunately was fully described at the time by André P. Griffiths,[1] the general manager of the mine. The cavity, or 'vug,' was about 3 ft. wide, 5 ft. high and 10 ft. long. It was about half full of small loose grains and pieces of quartz, in which three pieces of *punga*[2] were found embedded in a vertical position. Mr. Griffiths states: "The reef at this point is 320 ft. below the reef outcrop, and 260 ft. below the brace of the shaft. The reef was 10 ft. wide, and composed of solid white gold-bearing quartz, without any sign of fracture or fissure, thus precluding the theory that the vegetable remains may have fallen into the reef through fissures formed subsequently to the lode. The pieces of *punga* are 12 ft., 2 ft. and 18 in. long, and 3 in., 1½ and 1 in. in diameter, respectively, and two of them show distinct remains of the roots. The organic matter has completely disappeared and has been replaced by iron pyrite, which has retained the exact structure of the original plant, showing the concentric layers and vascular system of this species of fern. No silicious coating is to be seen, neither do the remains show any silica. The surrounding quartz is practically free-milling, and contains but a very small percentage of sulphides."

Griffiths adds that a fragment of the altered tree-fern was shown by assay to contain 3 dwt. 6 gr. of gold, and 1 oz. 13 dwt. 6 gr. of silver to the ton; or a proportion of 1 oz. gold to 11 oz. silver. The bullion of the vein itself contains gold and silver in the ratio of 1 to 2.5. The country rock is andesite, altered to propylite on each wall for a considerable, but undetermined, distance. It is obvious that the pieces of tree-fern trunk were carried to the place where they were found in the vein, at a time when the vein-fissure com-

*Abstract from 'Mining Geology,' by Professor James Park, director Otago University School of Mines. *The Australian Mining Standard*, January 26, 1905.

[1] 'Notes on a Fossil Funga Found in Silverton Mines' by A. P. Griffiths. *Transactions* New Zealand Institute Mining Engineers, Vol. II, 1898, p. 35.

[2] *Punga* is the Maori name for the stem of the New Zealand tree-fern.

municated with the surface. In many places in New Zealand the hot springs are surrounded with forest vegetation, and silicious replacements of organic matter are abundant everywhere.

Posepny mentions the equally remarkable occurrence of tree-stems changed to galena from the Vesuvian mine Freyhung, in Bavaria. In these the fiber and annular rings could be easily recognized, being extremely plain on polished surfaces.[3]

In the ash beds, associated with the gold-bearing andesites, masses of wood, partly or wholly silicified and spangled with nests and veins of iron pyrite, are of common occurrence throughout the Hauraki region (north island of New Zealand). The Martha lode, and its numerous ramifying branches, the Silverton, Union and Amaranth lodes, at Waihi, are all contained in an area of about a square mile. The huge lodes, wide zones of silicified andesite and extensive propylitization of the andesite, prove that Waihi was an area of intense hydro-thermal activity some time prior to the eruption of the later rhyolite flows, which now form the plains, and wrap around the Martha and Silverton veins. The propylitization has already been shown by the Waihi mine workings to extend to a depth of nearly 900 ft. below present water level—that is, some 500 ft. below sea level. Obviously, the alteration of the andesite was due to the action of ascending and laterally moving thermal waters.

At Thames and Coromandel, in the same region, some of the most productive veins do not reach the surface of the enclosing rock; and the mine workings at Waihi have disclosed a similar feature in connection with a few valuable veins in the Waihi Company's property.[4]

In 1898, Captain F. W. Hutton, as the result of a petrographical examination of the Thames mining district, concluded that the veins were of hydro-thermal action.[5] T. A. Rickard, a well-known American geologist, who examined the same goldfield in 1891, when discussing Professor Posepny's paper on 'The Genesis of Ore Deposits,' describes the characteristic features of the district, with the view of adducing additional evidence of the association of thermal springs and later eruptive rocks.[6] He states that his examination of the ore occurrences and vein structure, though incomplete, led him to conclude that the deposition of the gold and its associated minerals had followed certain lines of altered country rock, which had been exposed to the effects of dying, but lingering, solfataric agencies.

[3] 'The Genesis of Ore Deposits' by Prof. Franz Posepny, 1901, p. 129.

[4] 'Notes on the Geology, Quartz Reefs and Minerals of the Waihi Goldfield,' by P. C. Morgan. *Transactions* Australian Institute of Mining Engineers, Vol. VIII, 1902, p. 168.

[5] 'On the Rocks of the Hauraki Goldfield,' by F. W. Hutton. *Transactions* Australian Association Advancement of Science, Vol. VIII, 1888, p. 245; and 'Source of Gold at the Thames,' New Zealand *Journal of Science*, Vol. I, p. 146.

[6] 'The Genesis of Ore Deposits,' New York, 1901, p. 222.

The Ohaeawai hot springs quicksilver deposits, north of the Hauraki peninsula, are of great importance, on account of the evidence which they furnish in connection with the genesis of solfataric ore deposits. The basement rocks consist of marly clays and greensands of lower Tertiary or upper Cretaceous age, which are covered with flows of basalt and beds of scoriæ. It is agreed by all geologists that the basalt constitutes the youngest rock formation in the district. The surrounding country is studded with old craters, and there is everywhere evidence of former intense volcanic activity. The hot springs, around which the quicksilver deposits are clustered, are situated about two miles southeast of Lake Omapere, which itself occupies the site of an old crater. They occur along the edge of a flow of basalt, which is overlain at this point by deposits of calcareous and silicious sinter and solidified silicious and carbonaceous muds, through which sulphur and cinnabar are finely disseminated. There are also deposits of pyrite with or without cinnabar, in some cases containing traces of both gold and silver.[7] The sinters also contain gold and silver. The ground around the springs is generally very hot, and all attempts to develop the quicksilver deposits have been frustrated by the large volumes of hot water encountered at shallow depths below the surface.

This district has been examined at different times by Captain Hutton, Sir James Hector, A. McKay, and the writer; but the best description is that of André P. Griffiths, who conducted extensive prospecting and mining operations there in 1895 and 1898. The mining operations and borings disclosed many important details, which could not be gathered from a surface examination.

The iron pyrite occurs in masses near the basalt, and also filling cracks and fissures in that rock. The thickness of the masses varies from 3 in. to 3 ft., but their other dimensions are extremely irregular. Close to the pyritic masses there is a hard, white, silicious sinter, from 8 to 10 in. thick, which Griffiths found to contain gold and silver in places. One assay of the sinter gave a value of $14.40 per ton, but unfortunately the proportions of the gold and silver are not given.[8] The cinnabar generally occurs lining small cavities and cracks in the solidified muds and sinters surrounding the original fissures in the basalt. It also occurs impregnating the sinter in an extremely finely divided form. Sulphur occurs throughout the sinter in larger proportion than either the cinnabar or pyrite. The hot springs give off large quantities of H_2S, and occasionally a little steam. The gas, escaping through the water of the pools and small streams, is partially oxidized, liberating sulphur which imparts a milky-white color to the pools, locally known as 'white lakes.' The beaches of the so-called 'white lakes' consist of sulphur, mixed with magnetic ironsand, and a small proportion of alum. Sulphur is also being sublimed, at the vents or openings in the rocks, from which H_2S and SO_2 gases escape.

[7] 'The Ohaeawai Quicksilver Deposits' by André P. Griffiths. *Transactions* New Zealand Institute Mining Engineers, Vol. II, p. 48.

[8] André P. Griffiths, *loc. cit.*, p. 50.

The prospecting work conducted by Griffiths disclosed some interesting features. A deposit of cinnabar and pyrite crops out at the foot of the hills, to the southwest of the main deposits. A shaft was sunk near it, and cut the lode at a depth of 35 ft. The ore was 2 ft. thick, and consisted of small crystals of pyrite, cemented by cinnabar. At this depth there was a strong evolution of H_2S, and the heat of the rocks increased so rapidly with the depth that mining was extremely difficult. It is noteworthy that the outcrop of this lode was found close to the charred trunk of a tree, partially embedded in hard silicious mud. The trunk and roots of the tree were coated with a thin film of cinnabar, as also were some pieces of fossil kauri gum found near the roots. A small trench was sunk over a small fumerole; and, at a depth of 10 ft., the temperature of the rock was found to be 185° F. No. 1 borehole, cased with 3-in. piping, was put down to a depth of 104 ft., where it encountered the edge of the basalt. At the same time it struck a fissure, from which hot mud was projected a height of 60 ft. for about 48 hours. The mud was succeeded by boiling water, charged with H_2S gas, which was found to issue at a pressure of 30 lb. per sq. in. Griffiths further mentions that the richest deposits of cinnabar were found in close proximity to the hottest fumeroles, and that at very shallow depths a temperature was soon reached which put a stop to mining operations.

Sodium peroxide promises to be a valuable carrier of oxygen, both in submarine work and also in mines.

The atomic weight of iodine has been re-determined by Baxter, who places it at 127,975, being counted from the 'c = 16' basis.

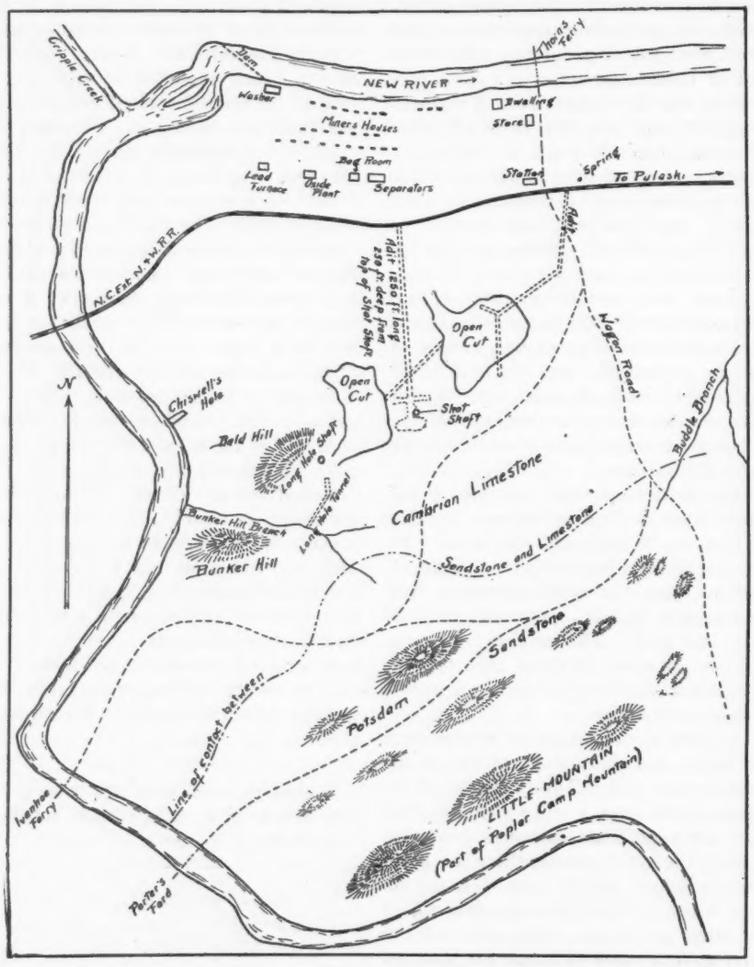
Metallic cerium promises to be a successful reducer of obstinate metals, such as vanadium and columbium. One reason is found in the excessive heat evolved by cerium on oxidation.

Siloxicon—Si_2C_2O—is a greenish-gray substance, first obtained as a by-product in the manufacture of corundum. Its specific gravity is 2.7, and it is very insoluble and refractory, being subject only to a few corrosives, as hydrofluoric acid. It represents a class of new, or half-discovered, products whose value and use will come with their supply.

Zinc Mining and Smelting in Southwestern Virginia.

By Edwin Higgins, Jr.

A large proportion of the zinc-producing tracts in Southwestern Virginia are owned by the Bertha Mineral Co., so that a description of the operations of this company will give a comprehensive idea of the zinc industry; mention will be made, however, of other properties on which croppings of both lead and zinc have been found. The mines are situated at Delton, Bertha and Austinville, on the North Carolina extension of the Norfolk & Western Railroad.



MAP OF MAIN PART OF LEAD MINE TRACT, AUSTINVILLE, VA.

The Delton mines, 12 miles southwest of Pulaski City, were opened in May, 1902. Up to December, 1903, when the deposit 'pinched out,' about 8,000 tons of zinc ore (carbonate and silicate) had been mined. This product, after concentration, contained 40% metallic zinc, 0.5% lead and 5% iron. Lead and iron were the only impurities. When the mines were first opened, about four tons of run-of-mine ore produced one ton of concentrate, but toward the last the ratio ran up as high as six to one.

The Bertha mines are situated in the Cripple Creek valley of Wythe county, Virginia, 20 miles southwest of Pulaski City. The Lower Silurian limestone, which underlies the property, appears along the river side. Just beyond, and 300 ft. above river level, there is a gently rising plateau, on which the mines are situated. The limestone, when stripped of its overlying red clay, presents large irregular chimneys, domes and pinnacles, due to the erosion of the soft portions of the formation. In the depressions between these chimneys, and forming a blanket between the rock and the clay, are found the orebodies, consisting of the carbonate and silicate of zinc. They range from 1 to 25 ft. in thickness, and vary in color, structure and composition, often containing vugs lined with crystalline incrustations and stalactites of singular beauty. The ore is practically free from impurity. The gangue is a soft unctuous clay (called 'buck-fat'), difficult to dissolve. Its specific gravity closely approaches that of the ore, hence the care required in concentrating.

When the mine was first opened the clay was removed in open-cuts, thus exposing the ore. As the work progressed into the hills, the removal of the clay became too costly, and a system of underground mining was introduced, the ore being reached through shafts of 3½ ft. diam. sunk in the clay. These shafts were fitted with removable iron castings, bolted together in sections. Inexpensive plank shafts, 38 in. square internally, were also used; they were sunk to the limestone bottom at its deepest points. Timbered shafts were then driven in the ore, following it around the chimneys. When these were encircled, a second drift was established just above the first. This process was followed until the ore had been entirely removed. The ore was wheeled to the shaft, loaded into iron buckets, hoisted by steam power, and dumped into cars holding about two tons, to be carried by locomotive to the 'dumps' at the head of the water carriage. The ore as mined contained about 26% metallic zinc. While worked for zinc, the property yielded about 15,000 tons of unwashed ore per acre. The ground was worked at the rate of 3½ to 4 acres per annum. The output was 200 tons per day, from 17 shafts, the working force being about 300 men.

Other portions of the property contain valuable deposits of limonite found in and upon the surface clay. This ore, when washed, contains:

Metallic iron (Fe)	49.09%
Sesquioxide of iron (Fe_2O_3)	70.01 "
Silica (SiO_2)	8.46 "
Phosphorus (P)	0.05 "
Manganese (Mn)	0.17 "
Sulphur (S)	0.73 "
Insoluble sulphates ($BaSO_4$)	0.83 "
Total moisture	19.74 "

The Bertha mines were first opened in 1879, when a small shipment of ore was sent to Providence, R. I. The resulting metal was of such purity and the prospects so promising that mining was at once started. In 1898 zinc mining at Bertha was stopped, and the property leased to the Pulaski Iron Co. This company made its first shipment of iron ore in December, 1898, and is still at work. Some zinc has been encountered, and shipments follow at intervals; the hope exists that when the covering of iron ore is removed there will be more zinc available.

Although the mill is not in operation at present, having been partly destroyed by fire, a description of the treatment of the Bertha zinc ores will be of interest. On the river bank there were two bins, one for zinc and the other for iron ore, each being provided with its water-carriage system. These bins were built on wooden trestles extending from the hillside; they had V-shaped floors, down the center of which passed the water trough. The ore, on being dumped from the cars, was fed into the trough, from whence it was carried, by a current of water, 1,300 ft. to the dressing-house below. The troughs were made of cast iron, 12 in. wide and 6 in. deep. Water was forced through a 6-in. column, by heavy Worthington pumps, to a tank above the bins, from which it was fed as required. Between the troughs (or flumes) was the hoisting-plane, operated

by steam power, for the transfer of the timber and supplies used in the mines.

The zinc ore, falling from the flume to a grizzly, where large lumps were broken, passed into a single log-washer, where it received a gentle sluicing. Here the adhering clay and 'buck-fat' were separated and dissolved. The lumps, being of a cavernous structure, and the interstices, containing gangue, required further disintegration. This operation was performed by a Blake crusher and a pair of Cornish rolls. Passing from the rolls, the ore went to a conical revolving screen. The larger pieces, passing over the screen, were dropped into a steel-plated conveyor, to be hand-picked. The smaller particles were further treated in four sets of Parsons jigs, and thoroughly concentrated. The tailing from the above treatment passed through a spitzkasten, and thence to two Hartz jigs, the slime being discharged over a series of settling dams into a pond, whence the water escaped to the river. This process produced an ore containing:

Metallic zinc (Zn)	38.08%
Oxide of zinc (ZnO)	47.61 "
Silica (SiO_2)	29.37 "
Oxides of iron and alumina (Fe_2O_3+Al_2O_3)	9.23 "
Combined moisture	8.23 "
Calcium carbonate ($CaCO_3$)	4.54 "
Magnesium " ($MgCO_3$)	2.07 "
Lead (Pb)	trace

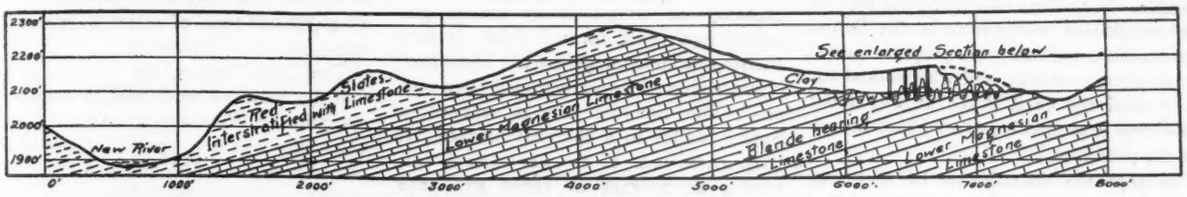
The absence of the impurities usually encountered in zinc ores is to be noted. For the expulsion of the moisture a roasting plant, containing an 8-ft. Taylor gas-producer and a 30-ft. cylindrical roaster, was attached. Separate from the dressing-house for zinc ore is a modern washer for treating 100 tons of iron ore per day.

Zinc ore from the Bertha mines was, and is today, when obtainable, converted into spelter at the smelting plant, producing a grade of metal which requires no subsequent refining.

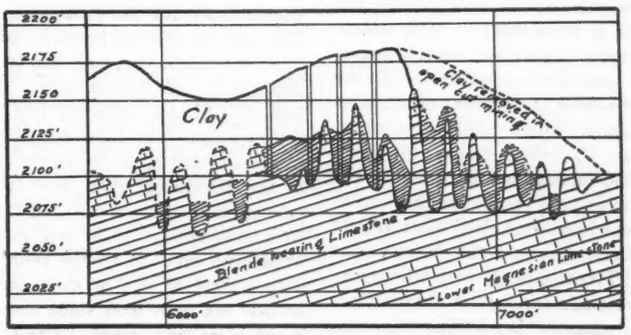
On the right bank of the New river, at Austinville, in the county of Wythe, are situated the historic 'Lead Mines.' This name still clings to the property, despite the fact that lead has long since ceased to be the chief product. The lead and zinc ores are confined to a belt of dolomite, both, together with iron ore, being found in combination in veins and masses. The general direction of the deposit, like that of the hills in which it is found, is northeast and southwest. The formation is anticlinal, the dip being southeast and northwest. The deposit ranges in width from 40 to 500 feet.

The principal varieties of lead ore obtained are lead oxide (plumbic ocher) and lead carbonate; they are also found in the alluvium, together with the sulphide and occasionally the beautifully crystallized sulphate. Zinc silicate and some carbonate are generally found underlying the lead and above the water level; while below, disseminated in the limestone, comes the blende. A bed of iron ore, of varying thickness, overlies these deposits of zinc and lead. The ore was evidently originally deposited, in the form of sulphide, from ascending waters, principally where the bedding plane was found twisted or crushed. Some well-defined faults exist. Above the drainage level the ore is oxidized, and has been converted by descending waters into silicate and carbonate. The richness of these deposits is evidently due to concentration through an intersection of veins.

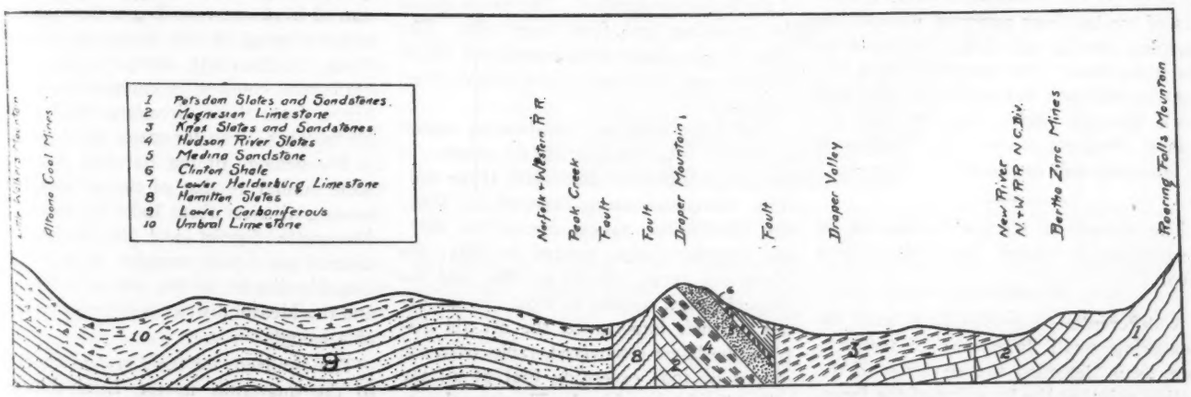
The Lead Mines were first worked for lead, by Colonel Chiswell, between 1750 and 1776. He is said to have been a native of Wales, and one of the early adventurers in southwestern Virginia; his operations embraced mostly open-work, although he made one attempt to reach the vein at a lower level. The remains of Colonel Chiswell's smelting plant show that a common air furnace was used, the hearth and roof of which were built of good fire-brick, evidently from England. The bottom of a cupel furnace was found in these remains, the scale of lead oxide on it indicating that it had been used for refining and "the trial to extract silver from lead." This probably originated the tradition, prevalent in



GEOLOGICAL SECTION, NEW RIVER TO BERTHA MINES.



ENLARGED SECTION SHOWING RELATION OF ZINC ORE TO THE LIMESTONE AND CLAY.



GEOLOGICAL SECTION, ALTOONA COAL MINES TO BERTHA ZINC MINES.

the vicinity, that Chiswell had converted lead into silver and had buried a pot full of coined silver somewhere about the place. Many unsuccessful searches have been made for this treasure.

Chiswell's career seems to have ended soon after the beginning of the Revolutionary War. He is said to have been a Tory and to have died in prison about 1776. Having been an alien, his property reverted to the State of Virginia, to be sold, soon after, to Stephen and Moses Austin. From that time up to the date of the acquisition of the tract by the Bertha Mineral Co. (in 1902), the property passed through many hands, and was worked for lead until the Civil War. It was about this time that zinc began to figure as one of the products.

In 1851 the manufacture of shot was begun, 8,244 bags being turned out between July 3, 1851, and March 31, 1852. Shot was manufactured for the Confederate Government up to December 17, 1864, when the works were burned by raiding Unionists. The damage was repaired, however, at the close of the war. Zinc seems to have made its first appearance about this time, when several tons of ore were sent by the owners, at the request of the War Department of the Confederate States, to the smelting works at Petersburg, Va. The course of events stopped zinc mining, but its presence had become known, and soon after the war inquiries came from the Lehigh Zinc Works, at Bethlehem, Pa., and the Mercer Zinc Works, of Trenton, N. J., with whom contracts were made for further shipments.

In July, 1902, the Lead Mine tract was purchased by the Bertha Mineral Co. At that time zinc and lead were being mined from open-cuts only. The underground workings consist of a labyrinth of shafts, drifts and slopes, reaching a depth of 250 ft. from the top of the hill. Large quantities of ore had been removed, without any apparent system, and almost entirely above the water level. The company, since taking over the tract, has pushed development work through shafts sunk at favorable points. Preparations are also being made to mine and mill the blende.

The theory of electric conduction in electrolytes is called the "dissociation theory."

A differential thermometer is used for measuring small differences of temperature, as in detecting the elevation of the boiling point, or the lowering of the freezing point of a solution, as compared with the respective points of the pure solvent. The thermometer is constructed with an upper overflow reservoir, and an enormous lower bulb of mercury. Direct reading is easy to one-hundredth of a degree, and estimation to one-thousandth. The space covered by one degree is obviously two or three inches on the stem.

Iron Ores of Wisconsin.*

By S. Weidman.

After a compresensive general introduction this paper considers first the limonite ore, the latest in origin, and close with the oldest, the red hematite ores of the pre-Cambrian crystalline rocks, in which class belongs the newly discovered ore in the Baraboo district.

Limonite ore at Spring Valley has been mined about 15 years. This ore is a surface deposit of typical bog ore, and is probably of comparatively recent geological age, being formed either in early Pleistocene time, or the period immediately preceding. The ore is mined from open pits. The limonite ore is smelted at Spring Valley in a charcoal furnace. In 1903, 27,128 tons of ore were mined, containing an average of about 46% iron. This ore was mixed with about an equal amount of red hematite, which was shipped in, and a little over 26,000 tons of pig iron were produced.

At Iron Ridge and Mayville, in Dodge county, iron ore has been mined almost continuously for the past 50 or 60 years. This ore is a soft red hematite, often called fossil or oölitic ore, and lies in irregular deposits in an approximately horizontal bed, the Clinton iron-ore bed of Upper Silurian age. The Clinton iron ore occurs to some extent in nearly all the States east of the Mississippi river, and is most important in Tennessee and Alabama. This formation appears to be well developed in Wisconsin only, in Dodge county. Probably a total of two or three million tons of ore has been won since these ore deposits were first mined. The Clinton ore is not a high-grade ore, the usual average content of iron being about 45 to 48%. On account of its high content of lime, however, it is in considerable demand for mixing with the more silicious ore of the Lake Superior districts. The ore is mined by tunneling and from open pits. The Iron Ridge mine, which produced 28,106 tons in 1902, is owned by the Illinois Steel Company.

The Lake Superior iron-bearing region is divided into five districts or ranges. In the order of their discovery, these are: The Marquette range, opened in 1854; the Menominee range, opened in 1877; the Gogebic range, opened in 1884; the Vermilion range, opened in 1884, and the Mesabi range, opened in 1892. In the order of their importance, the Mesabi district, the latest discovered, ranks first, the output of 1903 exceeding that of all the other districts combined. The annual production of ore on the Mesabi range in the last three or four years has been about equal to that of either Great Britain, France or Germany.

The Wisconsin portion of the Gogebic range was first geologically described and named the Penokee range. Later the Michigan portion of it was described and named the Gogebic range. Owing to the greater importance of the range in Michigan, the latter name has come to be quite generally applied to the entire range by mining men. The Wisconsin mines on the Gogebic range are located at Hurley and farther west. The Wisconsin end of the Gogebic range in 1903 produced about one-half million tons of ore from five or six mines. Since the Gogebic range was first opened in 1884, it has produced a total of 40,731,000 tons, of which 6,177,000 tons were mined in Wisconsin.

Two large mines, the Commonwealth and the Florence, have been in continuous operation in Wisconsin since the Menominee range was first opened. These mines respectively rank fifth and seventh in total output on the range. The total output of the Menominee range since 1877 is 45,988,855 tons, of which the two Wisconsin mines produced 4,055,699 tons.

The Baraboo district, or Baraboo range, as it will very probably be called by mining men, shipped no ore in 1903, but at the present time about 500 tons per day is being shipped from the Illinois mine, the only one in operation. In 1904 the Baraboo district produced 67,480 tons of ore.

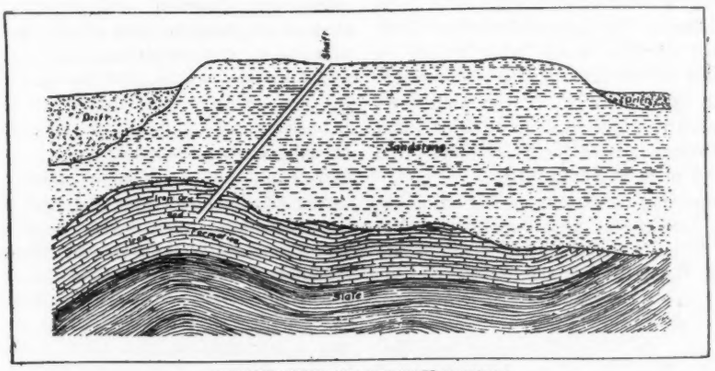
The Baraboo district is outlined geologically by the Baraboo quartzite ranges or Baraboo Bluffs. The district is located near the center of the southern half of the State, in Sauk and Columbia counties. The length of the district east and west is approximately twenty-eight miles and the width varies from two miles at the east end to ten or twelve miles in the middle and at the west end. The area of the entire district of pre-Cambrian rocks is about 225 square miles, much the larger portion of which is occupied by the Baraboo quartzite ranges. The ranges of quartzite constitute a nearly complete cordon of bluffs surrounding a depressed interior through which flows the Baraboo river. To the north, south and east of the bluffs the country is comparatively low, hence, from these directions the Baraboo bluffs can be seen for many miles.

The geology of the Baraboo district is quite similar to that of the various iron-bearing districts about Lake Superior. The Marquette district and the Menominee district are broad troughs of rock; the Gogebic district is one side of a trough, and the Mesabi district is likewise one side of a trough.

The similarity of the Baraboo quartzite to the quartzites in the Lake Superior region led Prof. T. C. Chamberlain, a number of years ago, to suggest the possibility of iron ores being associated with them. It was not until 1900, however, that iron ore was actually discovered. Previous to 1900, explorations had been carried on by the Douglas Mining Company without having found good ore, although the earlier explorations were located very near

*Abstract from paper in *The Wisconsin Engineer*, Vol. IX; by Dr. S. Weidman, Geologist, Wisconsin Geological Survey.

the later find. This company operated quite continuously from 1887 to 1889, and about $40,000 was expended in sinking a shaft near the present Illinois mine, and in sinking several other shafts in the near vicinity in the sandstone formation. The principal shaft, that near the Illinois mine shaft, was sunk 40 ft. to the clay slate formation, drifting 77 ft. to the west and then cross-cutting 60 ft. to the north, thus keeping wholly within the iron ore



CROSS-SECTION OF SAUK MINE.

formation. The best material obtained from this exploration averaged about 35% iron. The property in 1889 was leased by the Douglas Mining Company to the Chicago & Northwestern Railway Company, which mined the iron-formation rock for mineral paint. The first lease was for five years, and this was later renewed for five years longer. On the lapsing of the rights of the Chicago & Northwestern Company, the control of the property was secured by W. G. LaRue, Robert B. Whiteside and Herman Grotophorst. The exploration of this company was by churn and diamond drill work, under charge of Mr. LaRue, whose persistent faith was renewed by striking good ore in April, 1900, about 100 ft. west of the Illinois mine shaft, and very near the earlier Douglas mine explorations. To Mr. LaRue, therefore, belongs the credit of the first discovery of ore in the district.

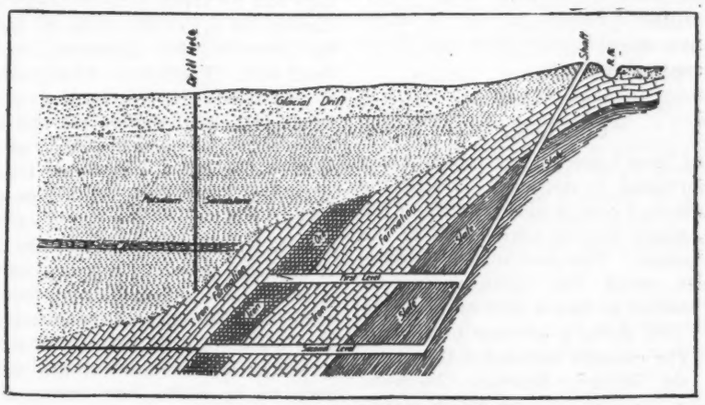
The iron ore deposits are wholly confined to the iron-bearing member of the Freedom formation, which member has a thickness of about 500 ft. and lies between the gray Seeley slate below and the dolomitic-marble member of the Freedom formation above. While the iron-bearing member is a continuous formation in the valley (where not removed by erosion) the ore deposits occur only irregularly here and there within this member. The ore deposits are irregular lens-shaped bodies, and constitute those portions of the iron-bearing rock containing about 54% iron and of sufficiently large extent as to warrant the cost of mining. A thickness of ore, across the bedding, of 20 or 25 ft. or more, with a lateral distribution of 300 or 400 ft. along the dip and also along the strike of the bedding, is generally large enough to constitute a workable deposit. Usually there is a pronounced extension of the ore parallel to the bedding, in one direction.

The thickness of sandstone which overlies the iron-bearing rocks in the valley generally varies from 200 up to 500 ft., with a possible maximum depth of the overlying formation of about 560 ft. The overlying formation of sandstone and drift is penetrated by the ordinary churn drills, and the underlying formation of iron-bearing and associated rock by diamond drills. In the middle portion of the valley, where the dolomitic marble occurs, this rock must also be penetrated to reach the ore-bearing strata below. The usual cost of churn drilling is about $1 per foot and of diamond drilling about $3 to $4 per foot, depending upon the character of the rock, and depth of drilling. The diamond-drill holes vary in depth from 500 to 1,200 ft., and their cost varies from $1,000 to about $5,000 each.

Explorations thus far carried on have shown up a number of workable ore deposits in the valley southwest of North Freedom. In other portions of the valley between the quartzite ranges, the iron-bearing formation is known to occur. The result of explorations as well as the geological structure of the district indicates that a large part of the valley is worthy of exploration, although the chances for finding ore in the various parts of it are by no means equally good. The portion of the valley between the bluffs in which ore may occur is about 20 miles long, east and west, and from one-fourth to over a mile in width. No part of this valley can be said to be thoroughly explored, and a large part of it is not explored at all. The large expense necessary to explore will probably make the district one of comparatively slow development, and it will be a number of years before it is thoroughly exploited.

As the ore everywhere lies a considerable distance below the surface, only mining by shaft is applicable to the district. The sandstone and drift overlying the ore and associated rock in the valley have already been referred to. One of the usual difficulties to contend with in sinking shafts and mining is the problem of ground-water, and in this regard the Baraboo district is probably no exception. The overlying drift, consisting of sand and clay, varies locally in its content of ground-water, although for the entire shaft the amount of water to be pumped probably depends entirely upon the effective pore space of the sand. The Potsdam sandstone in the valley and elsewhere in the State is a comparatively uniform rock with effective pore space of about 30%, and this formation has a quite uniform capacity for the flowage of ground-water.

The amount of ground-water in the crystalline rocks associated with the ore is comparatively small, the movement being entirely through irregular fractures pervading the formations. In the near vicinity of the contact with the overlying sandstone, within 50 or 65 ft., many of the rock openings extend to the sandstone, and here the water is abundant. The ground-water level in the valley is generally within a few feet of the surface.



CROSS-SECTION OF ILLINOIS MINE.

The sinking of shafts to the ore deposits in the Baraboo valley should present features of interest to the engineer. The accompanying drawings show the location of the shafts of the Illinois mine and of the Sauk mine with respect to the formations passed through.

At the Illinois mine, after attempts to sink the shaft through sandstone, it was

decided to penetrate the footwall slate by a shaft dipping 60° north and to cross-cut to the ore through the underlying strata. After reaching the iron formation at a depth of about 30 ft., but little water was encountered, and still less after the slate was reached, at a depth of 100 ft. In mining the ore above the first level more water is encountered than from below on account of the proximity of the sandstone.

At the Sauk mine the ore deposit lies immediately beneath the sandstone in nearly flat-lying formation, although the much crumpled rock at bottom of shaft has a steep local dip to the south. At this mine, therefore, it was necessary to penetrate the overlying sandstone to reach the ore deposit. The shaft was put down at an angle of 50° to the northwest.

The cost of mining and exploration in the Baraboo district will probably be higher on the average than in the Lake Superior region, where sandstone is absent and only glacial drift occurs. The district, however, has the advantage of more favorable location with respect to the centers of iron production and manufacturing in Milwaukee, Chicago and the Southwest. The freight rate on ore from the Baraboo district to Chicago is 80c. per ton. The freight rate from most of the Lake Superior districts to the upper lake ports is about 80c. per ton, to which must be added the lake freightage of 60 to 80c. per ton. For the district about Chicago, therefore, the Baraboo ore, mined at the mine, is, to the extent of the difference in cost of transportation, more valuable than that of the districts farther north.

Ohio Coal.

Chief Mine Inspector Harrison, of Ohio, has furnished a statement showing the production of coal in nine counties of the State, which furnish nearly 80% of the total output. The coal mined in these counties, which was 19,840,927 tons in 1903, reached in 1904 a total of 19,441,178 tons. This shows a decrease of 2% last year. The counties included in this statement are Athens, Belmont, Guernsey, Hocking, Jackson, Jefferson, Perry, Harrison and Stark. There were gains in Belmont, Jefferson and Perry counties, and losses in all the others named, the heaviest decreases being in Jackson and Stark counties. The highest production reported was 3,864,211 tons in Athens county, Belmont being second with 3,253,025 tons.

The mineral iodo-bromite is a peculiar isomorphous complex of silver chloride, bromide, and iodide. It is soft, yellow, and talc-like, with a glassy luster. The blowpipe reactions are naturally brilliant and unique, showing most of the halogen colors.

Early Discoveries of Diamonds.*

By David Draper.

To me Saturday, Nov. 6, 1869, is a red-letter day in the history of South Africa, for I happened to be present when Cornelis du Plooy, then owner of the farm Bultfontein, walked into the store of Mr. E. E. Hurley, now of Johannesburg, carrying in his hand a small bottle filled with stones, which he had collected on his homestead. Among these worthless pebbles there was one small diamond. When du Plooy was informed, his surprise found expression in the remark that there were so many of those things lying around on his place he did not consider them worth picking up. Lilienveld, Hurley and Hond purchased Bultfontein from du Plooy, and thus became possessors of the first true diamond mine in South Africa.

Prospecting operations on the adjoining farms, Dutoitspan and Vooruitzicht, resulted in the discovery of the Dutoitspan, Old De Beers and Kimberley mines. Jagersfontein was found after Dutoitspan and before Old De Beers. Twenty-four years later the Wesselton mine was discovered. Previous to the 'dry diggings' diamonds were found in the alluvial gravels of the Vaal and Riet rivers, and in the year 1873, in the small creek below the Lace mine, on the farm Driekopjes, Kroonstad District, Orange River Colony.

The following cutting from the Queenstown *Representative*, dated March 3, 1871, shows that diamonds were found in the Transvaal at a very early date:

"Great excitement was caused here a few days ago by young Joubert bringing in a diamond of 4½ carats, which he found on the farm of Mrs. Hennessy, 2½ miles from here (Pretoria). The government at once took steps, sent out a commission, Broderick, Lys, Skinner (the two former lately from the diamond fields), and their report is of such a nature that I have no doubt that in a week there will be quite a crowd at the new diggings. Piet Marais and H. Struben have taken a lease of part of the farm, and will commence operations at once. Several farmers have found diamonds on the banks of the Elands river. Two diamonds have been found at Zoutpansberg; the government has sent for them to be tested here—expected next week."

In 1870 a diamond had been found at Rustenburg. It was valued at £150. These finds were not considered as of much account. The diamonds were looked upon as emigrants, most likely lost by natives returning from the diamond fields.

In April, 1897, Mr. W. C. Schuller, watchmaker and jeweler, Rissik street, Johannesburg, brought a small bag containing minerals for me to inspect. He asked my opinion on the specimens, stating that his eldest son had pronounced them to be 'Dwyka conglomerate.' Upon my assuring him that they were 'hard-bank' from a diamond mine, he was greatly surprised, and became much excited. He told me that the specimens were from a farm held by him near Pretoria, and that if I was certain that they were from a diamond mine he would institute a search for diamonds, and he promised me a handsome reward.

Mr. Schuller informed me that he had taken up the property on the advice of a Mr. Van Diggelen, who assured him that the red specks in the rock (actually garnets) were cinnabar. Schuller told me that, as he knew nothing about diamonds and had no one to advise him, if I would assist him he would give me an interest in the property. In August, 1897, Mr. Schuller came again to see me,. and he brought a small diamond which he stated had been found by Van der Merwe, the owner of the farm, near the spot where the 'hard-bank' cropped out. I agreed to visit the property the next day (Sunday) together with Mr. Schuller and Mr. F. W. Bawden. We found Mr. Schuller's younger son at the mine, where he had dug a few shallow pits, all in diamond-bearing mineral. I measured the circumference of the mine and investigated it generally, confirming my previous opinion that it was a true diamond-bearing pipe. Mr. Schuller requested me to instruct him in the method of searching for diamonds, stating that neither himself nor any one connected with the venture knew anything about the business. On my return to Johannesburg I requested Mr. M. E. Frames to go out to the property and teach Mr. Schuller, Jr., how to wash and sieve the diamond-bearing rock. This he did, returning on the following Saturday with one small diamond. Mr. Schuller, Jr., continued washing operations for some time, finding a quantity of diamonds. Later on Dr. Molengraaff visited the spot and confirmed my opinion that a true diamond-bearing pipe had been discovered in the Transvaal. In company with Mr. Schuller I interviewed the Second Volksraad, then in session in Pretoria, and showed the diamonds to the chairman and members. On Sept. 13, 1897, I read the following paper at a meeting of the Geological Society:

"I wish to notify the members of this society that a most interesting discovery of a diamondiferous pipe has been made lately in the vicinity of Pretoria. I have the permission of the owners to make public the fact that diamonds have been found in what appears to be a small volcanic pipe, containing minerals closely resembling those in older known diamond mines. Garnets, 'carbon,' olivine and other minerals associated with the diamond are there in abundance, and, up to date, eleven diamonds, one weighing 16 carats, and several smaller ones, have been found in washing the blue. The interesting feature regarding this find of diamonds is that it is the first undoubted diamond mine found

*Abstracted from *The South African Mines, Commerce and Industries*, Feb. 4, 1905.

in the Transvaal, and as it is situated in the quartzites of the Magaliesberg, it is in a geological horizon much older than the Karroo shales of Kimberley, and also than the cave sandstones wherein the Monastery diamond mine is situated. As there is every likelihood of other diamond mines occurring in the neighborhood of the new discovery, I have obtained the owners' permission to state the above particulars in order to stimulate research in that part of the country."

The statement in the last paragraph has been amply verified, and the discovery of true diamond-bearing pipes of exceptional richness in the Transvaal is now an established fact. The late find at the Premier diamond mine is unprecedented in the history of diamond mining in the world. In other ways the discovery of true diamond-bearing pipes in the Transvaal has had far-reaching effects. The old theory that diamonds were derived from the carbon extracted by heat from the carbonaceous shales which surrounded the old craters near Kimberley has been exploded, and the contention which every Kimberley man maintained so stoutly, "that there were no mines outside of the Kimberley and Jagersfontein areas," has been completely dispelled. Kimberley men held that no 'hardbank' could exist as a surface rock, and that consequently the Schuller could not possibly be a diamond mine, but they found out that they had a good deal to learn about diamond mines. Most probably neither the largest nor the richest diamond mine has been discovered in South Africa, and the fabulous yield of the Premier should be a stimulant for further research. Great things grow from insignificant beginnings. Du Plooy's visit to Hurley's store was the first stage in the development of the greatest diamond industry in the world, and Schuller's interview with myself was the initial step in the diamond industry of the Transvaal.

In some places in southern Kansas, natural gas is sold for 3 cts. per 1,000 cubic feet.

The electrolysis of lead presents some peculiarities. As a metal it should pass to the cathode and be deposited there; but lead is 'ambiguous' in its chemistry. In the ordinary electrolytic cell, lead forms the dioxide or plumbic-acid anhydride, which, of course, must appear at the anode with other oxidized and oxidizing acid residues. Hence the trick is to cajole lead to go to the cathode as a reduced metal. The Betts process, now in use at Trail, B. C., employs a lead fluo-silicate as the electrolyte, whereby the lead acts as a metal and seeks the cathode. A recent invention cleverly suggests an electrolyte of fused lead-chloride, with an anode of galena. The metal is said to be deposited at the cathode, and the anodic chlorine attacks the lead sulphide, regenerating the lead bath.

The American Bromine Industry.

The recent unexpected invasion of the American market by German manufacturers, who have cut prices of bromides 50% in retaliation of our exports to Europe, suggests that the plan to divide the world's consuming territory, tried twice for periods of 5 and 10 years, has terminated reproachfully. The reason was the growth in the American production of bromine and bromides, from 404,690 lb. in 1880 to 879,312 lb. in 1904, an increase that is equivalent to about 117 per cent. In the past 25 years, the American output totaled 10,499,625 lb., approximately valued at $2,807,917. The largest annual production was 879,312 lb., in 1904, and the smallest, 199,087 lb., in 1887. For a number of years the domestic output has fluctuated between 400,000 and 500,000 lb.; this has been obtained by concentrating the bromides in the brine from the process of salt manufacture. The custom is to treat the bittern with sulphuric acid (forming hydrobromic acid), and using as oxidizing agents either chlorate of potash or manganese binoxide. The producing States in their order of importance are Michigan, West Virginia, Ohio and Pennsylvania, which engage about 13 operating companies.

The increasing production in the face of a limited consumption in this country has forced prices down for the bromides. The first attempt to systematize business operations in the domestic industry (begun in 1846 at Freeport, Pa.), was in the early '80's, when the larger manufacturers organized the selling agency known as the National Bromine Company, and advanced the price of bromine from 25 to 33c. per pound. Subsequently an agreement was made with producers at Stassfurt and Leopoldschall, Germany, whereby Germany supplied the European markets, and the National Bromine Company the domestic. In 1891, however, the compact (after an existence of some years) was made invalid, not by German manufacturers, who had remained faithful to their agreement, but by differences between domestic producers. During the interval from 1885 to 1891 domestic production fluctuated widely, rising from 320,000 lb. in 1885 to 428,334 lb. in 1886; then slumping to 199,087 lb. in 1887; jumping to 418,891 lb. two years later, and touching 387,847 lb. in 1890, the year before the dissolution of the manufacturers' agreement. An unfavorable result was the accumulation of stocks large enough to compel Americans, in the face of the limited home consumption, to export at low prices to England, France and Germany. As a consequence, German manufacturers retaliated by offering their goods in the American market at a big discount on domestic prices. During this cross-play, imported bromine sold in 1891 as low as 17.5c. per lb., while the average price realized by domestic makers for the whole year was not over 20c. per pound. In fact, in 1892 competition had become so keen as to cut the domestic price to about 17c. This was the beginning of the end, and negotiations were again opened to rehabilitate the international agreement. It was duly signed, higher prices were established both here and abroad, and thenceforth to 1901 whatever differences arose among the various producers were equitably settled. In the last three or four years, owing to the increased production in Michigan, there has been encouraged a feeling of independence on the part of domestic producers. Not only are they willing to supply the home demand, but their export to 'forbidden' European markets, where American bromides have been favorably received by consumers, has strengthened the opinion that the erstwhile international agreement is of no further use; we shall see. At any rate, Germany, which produces considerably more bromine and bromides than does the United States (and, it is claimed, at lower cost), has already captured business in America. Cooler judgment, however, prompts us to believe that, until consumption increases in proportion to production, the present competition can do no good.

By far the larger part of the bromine produced is used by manufacturing chemists, who market the bromides of potassium, sodium and ammonium among druggists and photographic supply houses. A small quantity of bromine is also used in the preparation of eösine (a phthaleïn coal-tar color), and also as a re-agent (in a 10% solution of potassium bromide) for precipitating manganese from acetic solution, for the conversion of arsenious into arsenic acid, and for the detection of nickel in presence of cobalt in the potassium-cyanide solution. Bromine dissolved in water makes an excellent disinfectant. Hope for expansion in consumption is centered in the larger use of bromination and bromo-cyanide processes of gold extraction, which are suggested as substitutes for chlorination and cyanidation.

The Linde process for liquefying air produces 50 liters an hour with the consumption of 1.8 h.p. per liter. Greater production lowers this figure somewhat.

The most perfect screws ever constructed were probably those used by the late Henry Rowland in his micrometer ruling-machine for making diffraction gratings. The rulings on these were of two grades, one having about 15,000 and the other 25,000 lines to the inch. The ruling was not as fine as in some of the celebrated Nobart's bands, used in microscopic tests; but the value of Rowland's rulings consisted in the accuracy of their width and position; the latter feature was correct to the hundred-thousandth of an inch. With these gratings Rowland measured the position of the solar-spectrum lines with an accuracy never before equaled.

Books Reviewed.

Perspective Drawing. By W. H. Lawrence. Chicago, Ill.; the American Institute of Technology. Pages, 71.

This is a set of notes and problems for the self-help student. It is prepared by an associate professor of the Massachusetts Institute of Technology, and is issued under the auspices of the American Institute of Correspondence. It is a convenient and reliable introduction to a large subject, and is recommended for those who are prepared to give the time and application that the title implies.

Mines d'Or et d'Argent de la Republique de Honduras. By Henry Jalhay. Antwerp, Belgium; published for the Republic. Pages, 48.

This paper is an official abstract of the information available concerning the gold and silver deposits of Honduras. It is given out with the authority of the Belgian consul-general at Honduras, being composed in French. Not the least valuable is the list of publications relating to the subject, inserted at the end of the pamphlet, and including English, French, German and Spanish writers and travelers.

Die Brickett-Industrie. Second Edition. By Friederich Jünemann. Vienna, Austria, and Leipzig, Germany; A. Hartleben. Pages, 320; illustrated.

This pamphlet is devoted solely to the briquetting of fuel, including wood and turf. It considers the materials used, their working into briquettes, their analysis, the calculation and use of the resultant heat, and the means for attaining high temperatures. One unpleasant feature of the book is the use of German rather than 'Roman' type. The publication is specially interesting in view of recent developments in the utilization of waste fuel.

Künstlicher Graphit. By Francis A. J. Fitz-Gerald. Translated from English into German by Max Huth. Halle-a-S., Germany; Wilhelm Knapp. Pages, 60; illustrated.

This is Volume XV of Knapp's series of monographs on Applied Electro-Chemistry. It is one of the few authoritative papers on artificial graphite. It is interesting to note that the author is chemist of the International Graphite Company, of Niagara Falls, and that it has been translated into German in good company with other technical monographs. A bibliography and a short name-index are added.

Elements of Mechanics. By Mansfield Merriman. New York; John Wiley & Sons. London; Chapman & Hall, Ltd. Pages, 170; illustrated. Price, $1.

This little text-book, by an eminent engineer, is intended to serve as an introduction to the science, and assumes only the most rudimentary knowledge of mathematics. The subject is grouped under 40 lessons, and each lesson is followed by a set of appropriate problems, carefully chosen to impress the points of the text. The type is large and clear, and the illustrative figures are small and neat. In his effort towards simplification the author has had to omit many details, of sufficient importance to rob the book of much reference value, but its limited intentions have been fulfilled.

The Testing of Continuous Current Machines. By Charles Kinzbrunner. New York; John Wiley & Sons. Pages, 323; illustrations, 249, and index. Price $2.

This manual originated in the needs of the students of the Municipal School of Technology at Manchester, England; and with this object the book has been shaped for those who need elementary instruction, though it leads up to practical consideration of advanced problems. The content, by chapters, is as follows: (1) instruments and apparatus; (2) resistance measurements; (3) measurement of temperatures; (4) insulation measurements; (5) measurement of speed; (6) no-load characteristics; (7) load characteristics; (8) magnetic measurements; (9) efficiency; (10) the separation of losses; (11) practical testing of continuous current machines; appendix on installation, care, and maintenance of electric machines. The book is well written, the subject matter well distributed and described, and the instruments, methods, and results are well illustrated. Mathematics are reduced to a minimum. It is commended, as a reliable and helpful handbook, both to the self-help student, and also to the practical worker.

United States Geological Survey. Mineral Resources of the United States. 1903. Compiled under direction of David T. Day, Chief of Division. Washington; Government Printing Office. Pages, 1,204.

The present volume of this work does not differ much from its predecessors. It is a little larger than the volume for 1902, and was issued a little earlier, which is a decided improvement. The different subjects have remained generally in the same hands as in previous years. Mr. Swank's iron and steel statistics are, of course, beyond criticism; no such complete record can be found in any other department, or in any other country. Mr. Parker's coal article is elaborate and carefully prepared, but it would have been better had it been half the present length. An interesting chapter, on a comparatively new subject, is that on 'Steel Hardening Metals,' by Joseph Hyde Pratt. The same author treats 'Sulphur and Pyrite' well; while Edmund O. Hovey's contribution on 'Phosphate Rock' is an excellent summary. It is impossible, however, to mention all the chapters, or to criticise them separately. As a whole, the volume is quite up to the standard of former years.

The Electrical Transmission of Energy. Fourth Edition. By Arthur Vaughan Abbott. New York; the D. Van Nostrand Company. London; Crosby Lockwood & Son. Pages, 675; illustrated.

It is but three years since the first edition of this work was published; but the period is ample for a growing art, like transmission, to demand a revised history. The book and the author are too well known to need more than a respectful reference; but in passing it should be said that the cast of the subject has been to suit the practicing engineer. Moreover, the treatment is limited to the transmission of electricity, no special consideration being given to the central developing station. The book is well illustrated and neatly printed. It is a summary of sound scholarship, wide and long experience, and facility in the art of putting fact in a convenient form. Ten folding diagrams accompany the book in a back pocket.

Jahrbuch der Elektrochemie for 1903. By Heinrich Danneel. Halle-a-S., Germany; Wilhelm Knapp. Pages, 930; with index. Price, $8.60.

The annual for 1902 was reviewed recently in the JOURNAL (February 16, 1905, p. 327), and again we are rejoiced by the perusal of the succeeding volume (for 1903), which is the 10th of the series. The last volume is more bulky than any of its predecessors, and is also better provided with reference facilities, the index of authors covering 38 pages, and the index of matter 44 pages. But it is the preceding 837 pages which interest the student and the worker, for the book represents the gist of the gleaning of nearly a hundred enumerated technical journals, dealing with both the theoretical and the practical. It is easy to pass justly complimentary remarks on such a monumental and masterly condensation as this, and such comments will pass without challenge. But we wish to show definitely some subjects wherein lie the practical reference advantages. Part I deals with the 'scientific' (wissenschaftlicher) or theoretical phase of electro-chemistry in 529 pages, leaving 358 pages for applied electro-chemistry in Part II. In the former part the following comprise some of the more noteworthy items: The Wehnelt interrupter, the theory of which is discussed in several pages; the capillary electrometer, and its theory; the periodic sequence, discussed both on the old short-series and the short-and-long series arrangements; the phase rule; the action of ferments in relation to catalysis; the electron theory; change of potential in the metamorphosis of the metal to the metal-ion; theory of the storage battery; electrolysis by the alternating current; elec-

trolysis of metals; a short review of a controversy hinging on the condition of a fused electrolyte, NaOH (but unfortunately not considering a fused silicate); and electrical discharge in gases, including radio-activity. These are only a few excerpts from hundreds of similar topics.

But it is to Part II, applied electrochemistry, that the readers of the JOURNAL will look with special interest. The storage battery is given due consideration, both the old lead and also the 'leadless' varieties, and these latter in both acid and alkaline solution. This is followed by a detailed and systematic consideration of forty or fifty elements and their inorganic compounds, metallic and non-metallic. One interesting feature is the devoting of one or several pages to progress in treatment of each metal. We are safe in saying that ere long it will take as many volumes to cover the ground of single elements like carbon, calcium, copper, lead, etc., and in only their inorganic relations as popularly understood. The practical electrolysis of organic compounds claims only 30 pages—but the inorganic is so much the more in evidence. Alkali-hypochlorite and 'bleach' receive fair notice; but when whole volumes are devoted to such subjects the annual must be limited.

The work is conscientiously done, and the comparative promptness of the volume is commendable, for the value of such journalism depends partly on its timeliness. As in previous years, the editor, Danneel, has had the assistance of several co-laborers who represent the best of the younger and more ambitious German workers, though we are sorry to note the loss of Borchers' name from the editorial list. The same may be said of this volume that was said of the previous one, namely, it represents a fullness and an accuracy of electro-chemical progress for 1903 that can be obtained nowhere else in such convenient and reliable condensation and reference. Whatever its faults, of omission or bias, it is indispensable because there is nothing else to take its place, which is large and is constantly growing larger.

Books Received.

In sending books for notices, will publishers, for their own sake and that of book buyers, give the retail price? These notices do not supersede review in a subsequent issue of this JOURNAL.

Metallurgie du Zinc. By A. Lodin. Paris, France; Veuve Ch. Durod. Pages, 812; illustrated. Price (in New York), $12.

Ore Deposits. A Discussion. Second Impression. New York and London; THE ENGINEERING AND MINING JOURNAL. Pages, 100. Price, $1.

Registration of Trademarks under the New Trademark Act. By Arthur P. Greeley. Washington; John Byrne & Co., Pages, 58. Price, 50 cents.

Connecticut. Report of the Storrs Agricultural Experiment Station. 1904. R. W. Stimson, President. Middletown, Conn.; State Printer. Pages, 252; illustrated.

Statistics of the Colony of New Zealand. 1903. *Volume I.* Compiled in the Office of the Registrar-General. Wellington, N. Z.; Government Printer. Pages, 296.

Tasmania. Report on Coal near Georgetown and Slate near Badger Head. W. H. Twelvetrees, Government Geologist. Hobart, Tasmania; Government Printer. Pages, 12; with map.

United States Geological Survey. Bulletin No. 249. Limestones of Southwestern Pennsylvania. By Frederick G. Clapp. Washington; Government Printing Office. Pages, 48; illustrated.

Annales des Mines de Belgique. 1905. *Volume X, Part I.* Prepared by the Bureau of Mines, in the Ministry of Industry and Labor. Brussels, Belgium; L. Narcisse. Pages, 464; illustrated.

Machine-made Line Drawings for the Illustration of Scientific Papers. By R. A. Daly. New Haven, Conn.; reprinted from the *American Journal of Science.* Pamphlet, 4 pages; illustrated.

Geological Survey of Ohio. Bulletin No. 3, Fourth Series. The Manufacture of Hydraulic Cements. By Albert Victor Bleininger. Columbus, Ohio; published by the Survey. Pages, 392; illustrated.

Twenty-seventh Annual Report of the Bureau of Statistics of Labor and Industries of New Jersey. 1904. W. C. Garrison, Chief of Bureau. Trenton, N. J.; State Printer. Pages, 620; illustrated.

The Mechanical Engineering of Collieries. Volume I. Boring, Shaft-sinking, Surface Arrangements, Headgear, Shafts. By T. Campbell Futers. London, England; the *Colliery Guardian* Company. Ltd. Pages, 128; illustrated. Price (in New York), $2.50.

United States Geological Survey. Water Supply and Irrigation Papers. No. 109. Hydrography of the Susquehanna River Drainage Basin. By John C. Hoyt and Robert H. Anderson. Pages, 216; illustrated. *No. 111. Preliminary Report on the Underground Waters of Washington.* By Henry Landes. Pages, 88. *No. 113. Disposal of Strawboard and Oil-well Wastes.* By R. L. Sackett and I. Bowman. Pages, 52. Washington; Government Printing Office.

Many metals, when adjusted in suitable couples, show a lowering of their inherent electric potential, which is more or less permanent. This quality is called passivity. The oxygen of the air is an agent causing the passive condition. The difference between the most active (+0.77 volt) conditions of columbium and its passive state (—1.68 volt) is the greatest yet observed, namely, 2.45 volts.

Correspondence.

We invite correspondence upon matters of interest to the industries of mining and metallurgy. Communications should invariably be accompanied with the name and address of the writer. Initials only will be published when so requested.

Letters should be addressed to the Editor.

We do not hold ourselves responsible for the opinions expressed by correspondents.

A Good Explanation.

Sir—In one of your January issues of this year there was an article on Alaska, in which mention was made of "ill-advised" work on the Kink mine, on the north fork of the Forty Mile river. Now, just as to what was meant by ill-advised is not clear to me, and as I happen to be the engineer in charge, I want to explain a little.

I was sent in by the company, in January, 1903, to begin operations, "they having sampled it the year before," by getting out logs, making surveys, etc. The ground had been reported to me as being very rich. As soon as the ground thawed so that we could get at it I made some pan tests, but could not find even pay, so notified the company. Two members came in. I could not at first make them understand that it would not pay. They said they got gold. I told them if they did that, they were salted. They said that could not be. I finally convinced them. Then we quit.

W. E. THORNE.

Fairplay, Colo., March 17, 1905.

Caught in a Sump.

Sir—The following incident, which came under my observation, seems worth telling: In an iron mine in the Furness district, in England, a new shaft was sunk by the engineers, and they began to instal the pumping machinery. At the foot of the section of the shaft devoted to this machinery was the sump, or well, to which the water drained from the different parts of the mine. The first piece of the pumping machinery to be lowered down the shaft was the sole-plate, a massive casting of several tons' weight, which was a close fit in the shaft. It was found upon attempting to lower this piece that the shaft had twisted, owing to a quicksand, and a man had to be suspended from a boatswain's chair—a narrow plank about two feet long—underneath the sole-plate, to cut away the timber down the side of the shaft wherever it projected sufficiently to prevent the descent of the casting. A considerable amount of nerve was required by any man to do this job, and the one who did it in this instance was the embodiment of that quality, a big, raw-boned Lancashire lad usually called "Yankee" by his mates, as he had been for some time in the States, and often referred to startling experiences of his in the land of the "Stars and Stripes." The work proceeded rapidly until the sole-plate was about 20 ft. above the sump, when suddenly the crab winch, around the drum

of which the rope suspending the sole-plate was wound, fractured, owing to a hidden flaw in the machine, and the sole-plate fell down the shaft, with the man underneath, until the rope was locked in the gear on the pithead. The man was forced down under the water in the sump for a moment, owing to the rope stretching, but when the rope contracted again the sole-plate was left suspended a few inches above the water, with the man clinging to it, endeavoring to keep his mouth above the water. Imagine the situation of the poor fellow—in utter darkness, almost completely submerged in the cold, muddy water, with merely a few inches of space between him and death, and the space liable to be annihilated at any moment by the further descent of the weight, which was still trembling above him, or by the ascent of the water, which was continually trickling into the sump and slowly rising around him. His condition reminds one of the 'Tales of the Inquisition,' by Poe. On the surface, his mates worked with superhuman energy to effect his rescue, although they believed his chance of surviving the shock was small. As speedily as possible a rope was rigged to another winch, and the sole-plate lifted sufficiently to get him out of his perilous position. He was in an exhausted condition when rescued, but his buoyant spirits soon reasserted themselves, and he told his mates that although they evidently doubted some of his American yarns, they had now witnessed one experience of his, which he would never forget—the half hour he spent in the pit sump.

J. Russell Mackay.

Brooklyn, March 1, 1905.

Dredging in California.

Sir—I have read with much interest your editorial entitled 'A Feminine Notion,' in the issue of March 9. There are a few pertinent facts bearing directly on this subject which may be of interest to some of your readers.

During the summer of 1900 the Ashburton Mining Company, of Boston, had a large gold-dredge built on Sailor Bar, which is a tract of land lying between Fair Oaks Colony and the American river, in California. This dredge was built without a stacker, the large boulders being screened out and dumped through chutes directly under the barge. The finer material passing into a 6-ft. sluice-box extending some 80 ft. astern, this sluice-box was pivoted at the stern of the dredge and swung in the arc of a circle having an 80-ft. radius. By this means the large boulders (4 in. and over) were deposited at the bottom, with the finer material on top, the latter being distributed through the swinging sluice-box in such a manner as to leave the ground in a fairly level condition. This portion of Sailor Bar has since grown up to grass and weeds, and might be considered tillable land.

In May, 1903, this dredge was destroyed by fire. It was rebuilt as soon as possible and a stacker installed instead of the swinging sluice-box. When using the swinging sluice-box it was necessary to employ a 24-in. centrifugal pump, driven by a 150-h.p. motor, actually using about 130 h.p. By the use of a stacker, the same end was attained by means of a 30-h.p. motor driving a belt-conveyor and using about 25 h.p. Thus a saving of 105 h.p. was effected.

At 1.5c. per kw. hour, which is the usual price paid for electric power for dredges in California, and figuring that the dredge handles one and one-half acres per month, and works 75 per cent of the time, the saving would be about $423 per acre. Allowing $100 per acre for repairs, etc., to the stacker, which would not be required should a sluice-box be used, it leaves $323 per acre as the cost of replacing the ground in a fairly level condition, with the larger boulders on the bottom. These figures are deduced from the actual costs of operating the two Sailor Bar dredges.

There are many other objections to operating a gold-dredge under California conditions without a stacker, which would undoubtedly bring up the cost to between $400 and $500 per acre.

There were several statements made before the California Federation of Women's Clubs which were incorrect and absurd, but which, if true, might convince many people that the gold-dredge was detrimental to the commonwealth at large. Among these was the assertion that nearly all the dredges were owned and controlled by companies and syndicates living outside the State, and that nearly all the money taken out was sent East, in no way benefiting California. They do not mention that each dredge operating in California disburses from two to five thousand dollars each month for labor, supplies, etc., nine-tenths of which goes into the pockets of residents of California.

The statement was also made that the greater portion of the Sacramento valley would ultimately be dredged for gold; this is, of course, ridiculous, and if our feminine friends would take the time to secure data on this point, they would find that only an almost infinitesimal per cent of the arable land of California is at all suited to gold dredging. It is my opinion that not over 100,000 acres will be used for this purpose.

Supposing my estimate to be correct, the people of California will receive something like $300,000,000 for labor, supplies, etc., which they otherwise would not get; besides this, an equal amount would be paid in dividends, a large portion of which also goes to California people. Another feature is overlooked, and that is the fact that the taxes paid directly into the State coffers are several times greater than would be paid should the land be used for agricultural purposes.

As is mentioned in your editorial, the gold-dredge does not injure other people's property, but only destroys its own for agricultural purposes; but in so doing it adds to the wealth of our country at large something like $6,000 for each acre mined, at least $4,000 of which goes to the people of California. I might mention many other facts to show the absurdity of the proposed legislation, but it is not my intention here to enter into a complete analysis of the finer points involved, but only to add a few words to your very sensible editorial.

Robt. E. Cranston.

Sacramento, Cal., March 17, 1905.

The measurement of the conductivity of flames containing salts in fine dust shows that ionization is not limited to the immediate vicinity of the electrodes, but is distributed through the whole flame.

Heptorite is the name of a new variety of monchiquite. It looks like a fine-grained basalt, and consists of basaltic augite, acicular hornblende, a violet-blue hauynite, in a glassy base, which itself may be analcite. The name is the Greek equivalent of the Siebengebirge (the Seven Mountains) near Bonn, Germany, where the dike of heptorite was found.

Wire Screen.—In the case of safety lamps, where it is of the utmost importance that an efficient conducting mass be maintained, the thickness of wire has always been specified, and in England has varied from $\frac{1}{40}$ to $\frac{1}{60}$ in. diam., the number of apertures being 784 per sq. in., and the mesh No. 28. The size of the apertures would vary from $\frac{8}{280}$ to $\frac{7}{105}$ in.; the original apertures fixed by Sir Humphry Davy were $\frac{1}{125}$ in. for gauze, but larger apertures, $\frac{1}{100}$ in., for instance, were permissible, provided the depth equaled the diameter. This shows that the relation of aperture to solid surface in a screen has attracted attention for some time, even outside mining circles.

Cyanide Antidote.—W. H. Jolliman (*Journal* of the Chemical, Metallurgical and Mining Society of South Africa, January, 1905) says that there is difficulty in insuring the stability of the ferrous sulphate in the antidote generally in use. If it is kept in a bottle with air above, it oxidizes in time. The suggestion to boil it and seal it up may be impracticable; so also is the suggestion to keep it under oil. There is a simple way of getting over the difficulty, namely, the addition of a little hypophosphorous acid, which will preserve the ferrous sulphate even if in contact with the air for a long time. The acid referred to is a powerful reducing agent, and keeps the whole of the iron compound in the condition in which it is required when used as a cyanide antidote.